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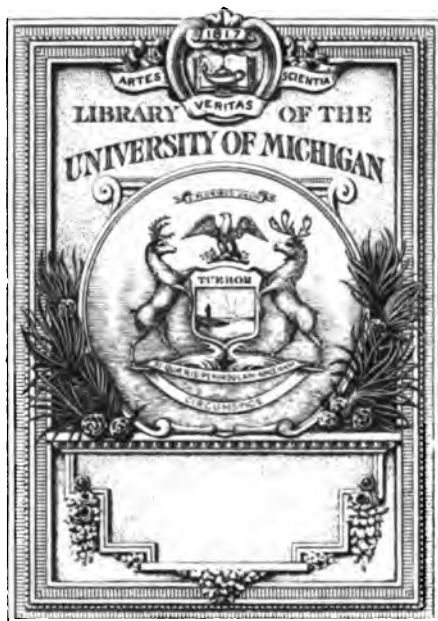
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DOCUMENTS

OF THE

ASSEMBLY OF THE STATE OF NEW YORK.

ONE HUNDRED AND FIFTH SESSION,

1882.

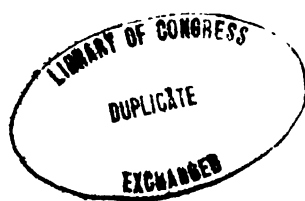
VOLUME I.—Nos. 1 to 9 Inclusive.



ALBANY:

WEED, PARSONS & CO., LEGISLATIVE PRINTERS.

1882.



STATE OF NEW YORK.

No. 1.

IN ASSEMBLY,

JANUARY 3, 1882.

LIST OF MEMBERS

OF THE ASSEMBLY OF THE STATE OF NEW YORK FOR
1882.

County.	District.	Name.
Albany	1	Michael J. Gorman.
	2	Aaron Fuller.
	3	Amasa J. Parker, Jr.
	4	John McDonough.
Allegany .....	..	Washington Moses.
Broome .....	..	Francis B. Smith.
Cattaraugus	1	Elisha M. Johnson.
	2	Elijah R. Schoonmaker.
Cayuga	1	Thomas Hunter.
	2	William Leslie Noyes.
Chautauqua	1	Albert B. Sheldon.
	2	Milton M. Fenner.
Chemung .....	..	Orville P. Dimon.
Chenango .....	..	Silas W. Berry.
Clinton .....	..	Benjamin D. Clapp.
Columbia .....	..	Abram L. Schermerhorn.
Cortland .....	..	Alburtis A. Carley.
Delaware .....	..	Chester H. Treadwell.
Dutchess	1	Alfred Bonney.
	2	John O'Brien.
Erie	1	Jeremiah Higgins.
	2	Frank Sipp.
	3	Arthur W. Hickman.
	4	Timothy W. Jackson.
	5	Job Southwick, Jr.

County.	District.	Name.
Essex.....	..	James W. Sheehy.
Franklin.....	..	William T. O'Neil.
Fulton and Hamilton.....	..	James W. Green.
Genesee.....	..	Joseph W. Holmes.
Greene.....	..	Samuel H. Nichols.
Herkimer.....	..	Albert M. Ross.
Jefferson.....	1	Isaac L. Hunt, Jr.
	2	Henry Binninger.
Kings.....	1	John Shanley.
	2	M. J. Hannan.
	3	James G. Tighe.
	4	Daniel M. Kelly.
	5	Thomas J. Sheridan.
	6	Patrick H. McCarren.
	7	George H. Lindsay.
	8	Moses Engle.
	9	James W. Monk.
	10	Richard J. Newnan.
	11	Alfred C. Chapin.
	12	Jaques J. Stillwell.
Lewis.....	..	G. Henry P. Gould.
Livingston.....	..	Kidder M. Scott.
Madison.....	..	Ladurna Ballard.
Monroe.....	1	Judson F. Sheldon.
	2	Charles S. Baker.
	3	Alexander R. Butts.
Montgomery.....	..	Cornelius Van Buren.
New York.....	1	Michael C. Murphy.
	2	Thomas Maher.
	3	William H. McIntyre.
	4	John F. Ahearn.
	5	Thomas Bogan.
	6	Matthew Patten.
	7	Lucas L. Van Allen.
	8	John E. Brodsky.
	9	James D. McClelland.
	10	John C. Niglutsch.
	11	J. Hampden Robb.
	12	David Gideon.
	13	Henry L. Sprague.
	14	James J. Costello.
	15	Jacob Cooper.

County.	District.	Name.
New York	16	James Edward Morrison.
	17	Michael J. Costello.
	18	John J. Cullen.
	19	John McManus.
	20	James Haggerty.
	21	Theodore Roosevelt.
	22	Edward C. Sheehy.
	23	Leroy Bowers Crane.
	24	Matthew P. Breen.
Niagara.....	1	Joseph W. Higgins.
	2	Thomas V. Welch.
Oneida.....	1	Patrick Griffin.
	2	Morris R. Jones.
	3	Frank A. Edgerton.
Onondaga	1	Thomas G. Alvord.
	2	Elbert O. Farrar.
	3	John Lighton.
Ontario.....	..	John Raines.
Orange	1	Joseph Lomas.
	2	William H. Clark.
Orleans .....	..	Henry M. Hard.
Oswego.....	1	William A. Poucher.
	2	Byron Helm.
Otsego.....	1	J. Stanley Browne.
	2	Henry T. Harris.
Putnam .....	..	Robert A. Livingston.
Queens	1	Townsend D. Cook.
	2	John J. Mitchell.
Rensselaer.....	1	Charles E. Patterson.
	2	Richard A. Derrick.
	3	Rufus Sweet.
Richmond.....	..	Erastus Brooks.
Rockland .....	..	John Cleary.
St. Lawrence	1	Abel Godard.
	2	Worth Chamberlain.
	3	George Z. Erwin.
Saratoga	1	Benjamin F. Baker.
	2	Delcour S. Potter.
Schenectady.....	..	John D. Campbell.
Schoharie .....	..	Edwin D. Hager.
Schuyler .....	..	Minor T. Jones.
Seneca.....	..	Albert M. Patterson.

County.	District.	Name.
Steuben.....	1	Orange S. Searl.
	2	Allen A. Van Orsdale.
Suffolk.....	..	George M. Fletcher.
Sullivan .....	..	Edward H. Pinney.
Tioga .....	..	Jacob B. Floyd.
Tompkins.....	..	John E. Beers.
Ulster	1	George H. Sharpe.
	2	Eugene F. Patten.
	3	Thomas E. Benedict.
Warren ...	..	Nelson W. Van Dusen.
Washington	1	Robert Armstrong, Jr.
	2	George Northup.
Wayne.....	1	Oscar Weed.
	2	William E. Greenwood.
Westchester	1	Edwin R. Keyes.
	2	William H. Catlin.
	3	George W. Robertson.
Wyoming .....	..	Henry N. Page.
Yates.....	..	John T. Andrews, 2d.

ANNUAL MESSAGE

OF THE

G O V E R N O R

OF THE

STATE OF NEW YORK.

TRANSMITTED TO THE LEGISLATURE JANUARY 8, 1882.

ALBANY:
WEED, PARSONS AND COMPANY.
1882.

STATE OF NEW YORK.

No. 2.

IN ASSEMBLY,

JANUARY 3, 1882.

GOVERNOR'S MESSAGE.

STATE OF NEW YORK:

EXECUTIVE CHAMBER,
ALBANY, *January 3, 1882.* }

TO THE LEGISLATURE:

Uninterrupted prosperity has attended the people of this State during the year just ended, in all commercial and industrial interests, save in the pursuit of agriculture, from which only a moderate return of the products of the soil has been realized in consequence of the summer drought; but this deficiency has not been such as to occasion suffering or alarm. Stimulated by the unprecedented development of manufacturing enterprises of various kinds, cities and villages have taken new and rapid growth; and the establishment of many recent railway lines promises at no distant day, important and valuable additions to public facilities for transportation. Investments in building and other permanent improvements, have been larger and less speculative than in any previous year; and an increasing demand for labor, therefore, with

corresponding benefits of compensation, has perceptibly improved the condition, and promoted the contentment, of the working classes. To the shiftless and improvident, want and idleness seem alone confined. For these blessings in such measure bestowed, as well, also, for the satisfactory state of the public health, the observance of law, and the preservation of order, it becomes us to manifest sincere thankfulness to the Source of All Good, for His gracious care; and gratefully to seek His continued favor and guidance through the coming year.

But though peculiarly blessed in material respects, we have been suddenly plunged into national grief and mourning. The wicked assassination of the President of the United States convulsed every heart. The whole civilized world felt the blow. That the chief magistrate of this great republic should be murderously assailed, and languishing, die, in a time of such general prosperity and peace, produced a shock unparalleled in our history. Sorrow fell over all like a pall. The expressions of sympathy, coming with signal accord from every quarter of Christendom, evidenced, impressively, the amity and respect entertained toward us by all enlightened nations. But that such an appalling event could occur without violent or disastrous consequences to public order, and with no excitement or turmoil attending the transfer of executive power to the constitutional successor, affords a fitting illustration of the wisdom and stability of our form of government, enduring in the devotion and loyalty of the American people. To the munificent provision for the widow and fatherless children, quickly undertaken and accomplished in a noble impulse and spirit, citizens of this State contributed with a liberality and zeal alike honorable to themselves and to the proud name sustained by New York in the sisterhood of the Union.

FINANCES.

The prudent and economical administration of the financial affairs of the State is demonstrated by the condition of the State Treasury, and must prove gratifying to every citizen. During the past year

the public revenues have been adequate to satisfy all legitimate claims, and provide \$376,500 for the Sinking Fund, leaving on hand besides, a surplus larger by \$1,846,856 than that which existed at the close of the preceding year. The operations of the financial department for the past fiscal year and the general condition of the State Treasury on the 30th of September, 1881, are exhibited by the following detailed statement :

Receipts and Payments.

Aggregate balances in the Treasury of all the funds October 1, 1880	\$3,448,215 38
Aggregate receipts during the fiscal year ending September 30, 1881.....	14,940,403 90
	<hr/> \$18,388,619 28
Deduct payments during the year.....	12,856,760 57
	<hr/>
Balance in the Treasury September 30, 1881	\$5,531,858 71
	<hr/>
The amount of receipts into the Treasury on account of the General Fund Revenue, during the year ending September 30, 1881.....	\$8,751,084 80
The payments.....	6,986,370 01
	<hr/>
Apparent surplus September 30, 1881	\$1,764,664 79
	<hr/>

Supplementary Statement.

Balances due from County Treasurers, September 30, 1881, on State tax of 1880	\$247,025 47
Add amount paid on account of 1881, appropriations, included in tax levy payable into the State Treasury in April and May, 1882, of which \$440,000 was for New Capitol.....	1,021,272 51.
Add apparent surplus of the Revenue, September 30, 1881, as shown in preceding statement.....	1,764,664 79
	<hr/>
Total.....	\$3,032,962 77
Deduct balances of 1880, appropriations unpaid and in force September 30, 1881.	533,347 50
	<hr/>
Actual surplus September 30, 1881.....	\$2,499,615 27
	<hr/>

Debt.

On the 30th September, 1880, the total funded debt was \$9,114,054.87, classified as follows:

General Fund (Indian annuities).....	\$122,694 87
Canal.....	8,988,360 00
Bounty.....	3,000 00
Total.....	<u>\$9,114,054 87</u>

On the 30th September, 1881, the total funded debt was \$9,109,054.87, classified as follows:

General Fund (Indian annuities).....	\$122,694 87
Canal	8,988,360 00
Bounty.....	3,000 00
Total.....	<u>\$9,109,054 87</u>

A balance of \$2,422,981.57 in the Canal Sinking Fund leaves the amount of that debt, unprovided for September 30, 1881, at	<u>\$6,560,378 43</u>
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The State debt on the 30th September, 1880, after deducting the unapplied balances of the Sinking Funds, amounted to.	\$7,059,574 70
On the 30th September, 1881, including \$122,694.87.....	<u>6,683,073 30</u>

Showing net contributions to Sinking Fund of.....	<u>\$376,501 40</u>
---	---------------------

The actual reduction of the debt during the same period by cancellation being	<u>\$5,000 00</u>
---	-------------------

TAXATION.

The tax levy enacted by the last Legislature for the current fiscal year, is at the rate of $2\frac{1}{4}$ mills, which it is estimated, will yield, on the present valuation, a revenue of \$6,032,829.61. The levy of the preceding year was at the rate of $3\frac{1}{4}$ mills, and produced \$9,232,542.33. Thus it will be seen that the burden laid on the tax payers directly for State purposes, has been reduced this year more than one-third, as compared with the previous year. With the large surplus now in the treasury, if the appropriations by the present Legislature be confined to the actual necessities of the State,

the rate of taxation for the coming year can be still further and materially reduced. Sound policy dictates that the present encouraging condition of the fiscal affairs of the State shall not be disturbed by inconsiderate or extravagant legislation, but that appropriations be confined to legitimate expenditures, and the completion of public works now in progress.

The necessity of a revision of the laws relative to assessment and taxation still exists, and reform in this regard is urgently demanded by the people. This subject was earnestly presented in my previous annual messages, and much discussion was devoted to it by the last two Legislatures, without, however, securing satisfactory results. Beyond a modification of the law defining the term "land," nothing practical has been accomplished in this respect. One great defect in the assessment laws is their failure to reach personal property, thereby imposing an undue proportion of the burden of taxation on the owners of real estate. The reduction in the rate of taxation for State purposes affords but moderate relief to the long-suffering tax payer, for the reason that much the larger proportion of taxation results from expenditures made by city, village or county authorities; and in many localities the rate of taxation consequent upon large local indebtedness, is such as to render the condition of the land-owner extremely unfortunate.

Until some comprehensive and practicable measure be matured, and embodied in the statutes of the State, distributing the expenses of government, both local and general, fairly and equitably among all property owners, the issue will still remain, and be pressed for solution on the law-making authority of the State. Your attention is earnestly directed to this subject, as the importance of the question demands, in the hope and belief that your wisdom will be equal to the requirements of the case.

As a means of relieving to some extent, ordinary tax payers from the expenses of the State government, laws were enacted during the last two years, for special taxes on corporations. Some imperfections in the terms of these laws have prevented the accomplishment of all that was designed, but the results so far realized have been

such as to convince the practical observer that something still more effective and desirable can be reached by judicious amendment of existing acts. During the last fiscal year the sum of \$992,725.16 was received and paid into the State treasury under the operation of these laws, in addition to \$141,127.03 collected during the preceding fiscal year. The Comptroller will furnish suggestions, based on the experience of administering these special laws, that will doubtless aid you in framing the necessary amendments.

CANALS.

The limited movement of grain products, and unusual competition between the trunk lines of railway during the past season, have largely reduced the volume of traffic on the canals, whose revenues have suffered a corresponding reduction. During the calendar year 1880 the total number of tons moved was 6,457,656, while for the year 1881 the amount was only 5,175,505, showing a loss in traffic the current year, of 1,282,151 tons. Furthermore, canal freights have been lower than in any previous year; the average for the season, from Buffalo to tide-water, was, for wheat, $4\frac{88}{100}$ cents per bushel; and for corn, $4\frac{27}{100}$ cents per bushel. After deducting the tolls, at $1\frac{8}{100}$ cents per bushel for wheat and $1\frac{26}{100}$ cents for corn, the above rates netted the carrier but \$1.28 per ton; and during a portion of the season only 90 $\frac{1}{2}$ cents per ton from Buffalo to New York, a distance of nearly five hundred miles. The movement of west-bound traffic for 1880 was 1,518,290 tons, and in 1881, 1,365,418 tons; showing a decrease of 152,872 tons this year, notwithstanding the removal of tolls on this class of traffic.

The revenues of the canals for the year ended September 30, 1881, were as follows:

Tolls.....	\$810, 532 05
Rent of surplus water.....	1, 535 00
Miscellaneous.....	6, 197 56
Total.....	<u>\$818, 264 61</u>
Total expenditures for collection, superintendence and ordinary repairs.....	1, 023, 907 06
Expenditures in excess of revenue.....	<u><u>\$205, 642 45</u></u>

This deficiency in revenue was supplied from the fund for extraordinary repairs, in pursuance of section 2 of chapter 449, Laws of 1881.

The sum of \$818,264.61 (the gross income of the last fiscal year), under the constitutional restriction, will be the limit of expenditures for the current fiscal year, which will end September 30, 1882. But the estimated receipts from tolls will aggregate only \$640,000, leaving a deficiency of \$178,000 in revenue to meet the ordinary repair appropriation for the same year. This deficiency can be supplied in the same manner as last year, by a contingent appropriation from the extraordinary repair fund, of which there is left unappropriated about \$460,000.

It will be observed that the expenditures for the collection of tolls, superintendence and ordinary repairs for the last fiscal year were \$134,891.22 in excess of the preceding year. All of this amount, and a considerable sum in addition, was expended for necessary work which had been unavoidably postponed in consequence of the diminished revenues of the years 1878 and 1879; and for material to be used for repairs hereafter. The necessity for the purchase and accumulation of material for use in succeeding years is due to the constitutional restriction which limits the expenditures in any one year to the amount of gross income of the previous year. This safeguard is fully justified in view of the lessened revenues of the current year, and the prospect of still greater reduction of income for the year to come.

If the revenues for the current fiscal year, ending September 30, 1882, do not exceed the foregoing estimate of \$640,000, then that amount will be the limit for expenditures for the fiscal year ending September 30, 1883, regardless of the actual revenue for that year; unless, in the meantime, the Constitution be amended. This sum seems altogether insufficient for a year's maintenance.

There should have been contributed from the revenues of the last fiscal year to meet the constitutional requirements for deficiency in the Sinking Fund :

Interest on canal debt.....	\$538,602 00
For the sinking fund.....	450,000 00
Total not realized.....	\$988,602 00
Add for deficiency in tax of 1880.....	17,098 59
Add for interest on these deficiencies until same can be realized from taxes.....	80,456 05
Total amount to be supplied by tax.....	<u>\$1,086,156 64</u>

The competition of railways, the enlargement of the Canadian canals, and the development of the Mississippi river route, are important considerations with reference to the future capacity of the canals to earn the necessary revenue for maintenance. If, added to these, there should be a smaller foreign demand for breadstuffs, or reduced production in the western States, it is plain to be seen that under the present constitutional restriction on canal expenditures, the usefulness of the canals may be seriously imperiled, if not entirely suspended, until relief be secured through an amendment to the Constitution. In view of the time required for this process, your consideration of the pending propositions for constitutional amendment is respectfully suggested.

CANAL APPRAISERS.

There has been a large falling off in the number of claims for canal damages filed with the appraisers, as compared with the preceding year, and a proportionate diminution in the amount of damages claimed. Eighty-nine new claims, amounting to \$110,080, were presented last year, against two hundred and twenty-five claims, aggregating \$428,820, the year previous. One hundred and seventy-two cases were heard and determined by the Board of Canal Appraisers during the year. On those considered the damages claimed amounted to \$418,775, while the awards allowed thereon were only \$10,635.72. The number of claims awaiting adjudication, and on file in the department at the end of the year, was seven hundred and forty-one. The Appraisers are entitled to credit for the care with which they have kept their important trust, and guarded the interests of the State committed to their charge.

PUBLIC EDUCATION.

The most notable feature respecting the interests of public education, is presented by the marked decrease in the number of children attending public schools during the past year, as shown by reports made to the Superintendent of Public Instruction, in which the number is stated at 1,021,282, as against 1,031,593 for the preceding year. It is not easy to determine what has caused this noticeable difference, unless, possibly, it be attributable to the increased demand for labor, by reason of which children may have been withdrawn from the schools to engage in various employments. Whatever the cause it is sincerely to be regretted, as it cannot but prove unfortunate to the well-being and usefulness of the rising generation.

The constant decline of the school district libraries affords striking evidence of the necessity for more liberal provision for their support. The number of books in these libraries last year is reported at 707,155, which, compared with the previous year, is a decrease of 28,508. In 1860 the number was 1,286,536; and a gradual but certain reduction has been going on each succeeding year. These libraries afford many facilities for information, not only to children, but likewise to adults; and they should not be permitted to deteriorate or waste away. Perhaps a change from the district system to that of town libraries might be advantageously made. But it is clear that some well timed and expedient method should be adopted to arrest the present downward tendency; otherwise the \$50,000 under present laws annually appropriated to library purposes by the State, might better be directed to some other object.

Common School Statistics.

For the year ending September 30, 1881:

Total receipts, including balance on hand September 30, 1881..	\$11,984,715 08
Total expenditures.....	10,808,802 40
Amount paid for teachers' wages.....	7,775,505 22
Amount paid for school-houses, repairs, furniture, etc.....	1,467,361 00
Estimated value of school-houses and sites.....	31,091,630 00

Number of school-houses	11,894
Number of school districts, exclusive of cities	11,248
Number of teachers employed for the legal term of school ..	20,728
Number of teachers employed during any portion of the year,	30,826
Number of children attending public schools	1,021,282
Number of persons attending Normal schools	5,944
Number of children of school age in private schools	108,309
Number of volumes in school district libraries	707,155
Number of persons in the State between the ages of five and twenty-one years	1,662,813

COLLEGES AND ACADEMIES.

Reports have been received by the Regents of the University during the past year, from twenty-two literary colleges, comprising 388 instructors, 4,389 students, and representing property to the amount of \$17,240,400; also, returns from 236 academical institutions with 1,182 instructors, and 31,036 pupils; of the latter of whom 9,759 are stated as pursuing academic studies and forming the basis for the apportionment of the literature fund.

The past year has been exceptional for the unusual number and amount of donations made to the various colleges and universities of the State. These institutions are keeping pace fully with those of other States, and afford gratifying promise of increased usefulness in the future. The demand for educated service is such that most of the graduates from the scientific courses of collegiate institutions find prompt and profitable employment. This fact is calculated to exert an important and most salutary influence on the material development of the country, and every relation of society.

As trustees of the State Library the Regents of the University have made provision for arranging and editing the Clinton manuscripts, and other State papers, under the authority heretofore granted by the Legislature. The scope and progress of this work will be reported to you in due season, and will doubtless engage an interest appropriate to its character.

BANKS.

Perhaps in no other way can the improved financial condition of the people of the State be more readily discerned and appreciated than from the condition of the banks, and more particularly the savings banks, in which the surplus earnings of people in moderate circumstances are deposited. Notwithstanding the smaller rate of interest now allowed depositors incident to the constant reduction in income from all really first-class securities, these institutions show large gains in the number and amount of deposits. A most gratifying feature of the condition of the savings banks, is the substantial increase of their surplus funds, thus insuring greater stability and security against loss in less prosperous times.

On October 1, 1881, seventy-two banks of discount and deposit were engaged in active business, under the provisions of the State banking laws; and their condition was as follows:

Resources	\$113,463,572
Capital	19,025,700
Surplus and profits	8,928,175
Due depositors	75,717,130
Other liabilities	9,792,567

During the year deposits increased, \$13,921,357; profits, \$869,895; loans and discounts, \$11,242,376. The net aggregate increase in assets was \$13,612,817. Five new banking associations organized during the year, and one changed from a State to a National bank; leaving four as the net increase in number of associations.

One hundred and twenty-eight saving banks reported July 1, 1881; eleven of which are in process of voluntary liquidation and do not receive deposits; the only act necessary to complete their final dissolution being the transfer of unclaimed balances, to the Superintendent. No savings bank closed during the year. In July last a certificate of authorization was granted for a savings bank in Buffalo, that being the only one organized since 1875. The condition of the savings banks on July 1 was as follows:

Resources.....	\$424,204,808
Due depositors.....	370,672,297
Surplus.....	53,303,383
Other liabilities.....	229,127
Number of open accounts.....	995,742

The increase in the several items during the year was as follows :

Resources.....	\$47,993,568
Deposits.....	35,210,727
Surplus.....	12,759,929
Open accounts.....	82,879

There are thirteen trust, loan and mortgage companies in operation in the State, owning \$130,000,000 of assets. The aggregate capital employed is \$12,000,000. During the year one new trust company organized.

There are ten corporations for the safe-keeping and guaranteeing of personal property, two of which organized during the year ; the capital invested being \$1,976,900.

INSURANCE.

A report on the condition of the several classes of insurance companies transacting business in this State, furnished by the Superintendent of the Insurance Department, presents a gratifying improvement in their condition during the past year.

On the 31st of December, 1880, there were 161 fire insurance companies doing business in this State, of which 86 were New York State companies, 53 of other States, and 22 foreign, with total assets of \$146,398,641 ; liabilities, including capital stock, \$97,784,334, and net surplus, \$48,614,307. These companies received during the year a gross cash income of \$66,420,034, and their gross cash expenditure was \$60,925,644. During the year 1881 six other State and three foreign fire insurance companies were admitted to transact business in this State. Four New York fire insurance companies discontinued business and reinsured their risks, and three other State companies withdrew their agencies and ceased to do business in this State, during the same period.

Twelve life insurance companies, organized under the laws of New York, are now in operation, with aggregate assets of \$214,647,574; liabilities, \$177,357,829; surplus, as regards policy-holders, \$37,289,744. Of other State life insurance companies, eighteen are now conducting business in this State, having assets of \$203,303,435; liabilities, \$169,031,510, and surplus to policy-holders, \$34,271,925. Of marine insurance companies eighteen are transacting business in this State, of which 10 are foreign, 6 New York, and 2 other State companies, with assets amounting to \$21,315,263, and a net surplus of \$1,443,177. There are also two New York and two other State casualty insurance companies doing business, with \$2,122,021 assets, and \$843,004 surplus.

Securities for the protection of policy-holders insured by the various insurance companies doing business in this State, of the kind and amount required by statute, were held on deposit by the Insurance Department on the 31st December, 1880, as follows:

New York State Life.....	\$3,977,560 00
New York Casualty.....	201,426 00
New York Fire.....	1,562,000 00
Other State Fire	20,100 00
Foreign.....	7,060,000 00
Aggregate.....	<u>\$12,821,086 00</u>

Within the last eight months the Superintendent of the Insurance Department has distributed to the policy-holders of bankrupt life insurance companies from the proceeds of securities held by him for their benefit, the sum of \$94,575.

CO-OPERATIVE INSURANCE.

The plan of co-operative insurance first inaugurated by various secret societies has, in recent years, become very popular; and many organizations have been established for this distinctive purpose. When prudently organized, and intelligently and honestly managed, this kind of associations undoubtedly offers the most economical mode of life insurance. Providing as it does for the comfort

of multitudes of families that might otherwise be left destitute and dependent, it is of the greatest importance that every prudential measure necessary be taken by the State to guard and protect these humane and praiseworthy associations from abuse. A bill passed the last Legislature to exempt this class of societies from all jurisdiction of the Insurance Department, which would have allowed unchecked introduction into this State, of hundreds of fraudulent, and speculative organizations existing in other States. It appearing that such a step would prove disastrous to the true interests of well-ordered organizations now so flourishing in our State, this bill was disapproved by me; and, thereafter, another measure was enacted providing for the conservative and helpful supervision of the Insurance Department, designed especially to foster and strengthen all interests involved, and protect them from the intrusion and depreciation of degrading influences. The frequent reports published of the disastrous results of wholesale graveyard insurance in other States, has more than vindicated the wisdom of the policy thus pursued. The general law providing for the organization of these societies can doubtless be amended to the advantage of *bona fide* associations; and it is hoped that the subject will receive due deliberation at your hands.

NATIONAL GUARD.

In furtherance of the policy suggested in my last annual message, the National Guard has been materially reduced in numbers, and a reorganization ordered on a basis which it is believed, will render the force more efficient and useful for the service required; while it will also effect a considerable reduction of unnecessary expenditures. Two of the division organizations have been dispensed with, and their commands consolidated with the remaining four general divisions. Three brigade organizations have also been abolished, thus leaving two brigades in each division.

The force, as reorganized, consists of four divisions, eight brigades, fifteen regiments, one organized battalion, forty-two separate companies of infantry, and seven separate batteries of artillery,

comprising, in the aggregate, 12,495 officers and enlisted men ; and this is believed to be abundant for any emergency liable to arise. Should it, however, be regarded desirable in the future, to increase the strength of the force, it can be done by enlarging the present commands, without duplicating organizations.

The usefulness of the National Guard, under our military system, does not depend so much on the number of men enrolled as on the efficiency and thorough discipline of the several commands. Much, too, depends on the character, intelligence and patriotic devotion of the officers and men in the service. It is believed that by raising the standard of qualification among officers, and the physical ability of the men, and by placing the troops in camp service at reasonable intervals, the present force will be made far more effective for practical purposes than a much larger one would be without these essential considerations. It was aimed to secure this desirable object, avoiding the necessity of enlarged appropriations of public funds for military purposes, that the policy of reducing the force has been pursued ; and it is confidently predicted that the course taken will be vindicated by experience.

The present mode of providing uniforms for the members of the National Guard is needlessly expensive and wholly unsatisfactory. It entails an undue expense on the men, and fails to provide such equipment as the needs of the service require. A service uniform provided by the State, that can be procured at a much smaller cost than the men are now able to obtain a less desirable article for, would prove far more useful in every respect. The adoption of this plan will require an amendment of the present law, which is respectfully commended to your favorable attention. The appearance of the troops of several of the other States, on the occasion of the military demonstration at Yorktown, in honor of the centennial celebration of the surrender of the British forces under Cornwallis, could not have failed to impress all interested observers with the advantages and desirability of a uniform dress for the militia.

THE NEW CAPITOL.

Very satisfactory progress has been made, the past year, toward the completion of the New Capitol. The Senate Chamber, although not entirely finished, was occupied a portion of the time during the last session of the Senate, but has since been substantially completed; and is, indeed, magnificent in architectural and artistic design. The rooms for the Executive Department were put in readiness, and formally occupied, several months ago; and they prove in every way well appointed. The Insurance Department and the State Board of Health are also, now located in the new building, while the rooms designed for the Military Department and the Superintendent of Public Instruction are nearly done, and will soon be occupied. The offices for the Secretary of State are now being placed in order, and are expected to be ready for use during the winter.

The Judges of the Court of Appeals express dissatisfaction with the apartments designed for their use, and seem unwilling to occupy them at present. They desire to have rooms set apart for them in another quarter of the building, and have indicated a preference for a portion of the space originally intended for the State Library. It is believed that a change in the location of the Library to the west end of the edifice would be quite satisfactory to the authorities having charge of the Library; which would afford opportunity for the change desired by the Court of Appeals. This, however, involves such a radical alteration in the plans of the building heretofore adopted, that legislative sanction would seem first to be necessary. Could the change suggested be effected without unreasonable expense, it would be, perhaps, quite desirable.

The expenditures on account of the erection and furnishing of the New Capitol during the past year have been as follows:

Balance of previous appropriations on hand as reported in the last annual message.....	\$421,180 60
Chapter 24, Laws of 1881.....	250,000 00
Chapter 325, Laws of 1881.....	750,000 00
	<hr/>
	\$1,421,180 60
Expended during the year.....	1,187,962 57
	<hr/>
Balance on hand December 16, 1881.....	\$233,218 03
	<hr/>

This amount will be required to complete payments on contracts not yet wholly completed; and on outstanding and unadjusted liabilities; and also, to continue work now in progress. The Commissioners in charge will, in due time, report to the Legislature a more detailed account of their proceedings, and indicate the amount of appropriation desirable for their purposes during the coming year.

Authority was given by the last Legislature for the demolition of the Old Capitol, at the discretion of the Commissioners, which can, probably, be advantageously effected early the coming spring. Provision should be made for the improvement of the Capitol grounds, with suitable embellishments, as soon as the old building and State Library are removed, in order to avoid the unsightly appearance that would otherwise be presented. Prompt action is very desirable, so that the trees and shrubbery that may be planted, can take early growth.

SALT SPRINGS.

The total amount of salt inspected on the Onondaga salt springs reservation, for the fiscal year ending September 30, 1881, was 7,633,394 bushels, and the financial operations of the agency were as follows :

Duties collected.....	\$76,334 47
Penalties, rents and sales.....	130 00
	<hr/>
Total receipts.....	\$76,464 47
Expenses incurred.....	59,470 24
	<hr/>
Surplus revenue.....	\$16,994 23
	<hr/>

In connection with this interest of the State, there is no particular occasion for remark beyond the fact that it seems to be well and profitably managed.

AGRICULTURAL EXPERIMENT STATION.

The board of control of the State Agricultural Experiment Station, created by chapter 702 of the Laws of 1881, after deliberate and very thorough consideration of the subject committed to them, and after careful examination of the various farms offered for the station, have finally determined upon its location near the village of Geneva, Ontario county; and have appointed a director, in accordance with the provisions of the statute. The location is regarded as extremely eligible for the purposes designed, and the property selected is in such condition with respect to buildings and general improvement, as to warrant the expectation that the station will be in successful operation within a very few months.

With the station established and in practical process, important results promotive of approved and profitable agricultural methods may be confidently looked for. Experiments directed by scientific men, whose tests shall have been proved, will be carefully noted; and all information as to the best means, and the product of given work in applied science of agriculture, will be disseminated for the benefit of those who choose to employ it. If this institution shall prove a help to larger production and more profit in the cultivation of the soil, and the growing of farm stock, its usefulness will soon be recognized, and its influence felt in the material advancement of the natural resources of the State. It is not by manual labor alone, but by intelligent forces combined with it, that the best effects are obtained. The trustees of the station will in due time make detailed report to the Legislature, as required by law.

PLEURO-PNEUMONIA.

It is a matter of congratulation that while the cattle disease known as pleuro-pneumonia, which formerly menaced the farmers in this

State is not entirely eradicated, it has been confined to limited areas ; and seems to be gradually disappearing. With a single exception, not likely to cause further trouble, the disease has been confined to a small portion of Long Island ; and it is hoped that it may be speedily and entirely eliminated from our territory. The total expenditure incurred in maintaining supervision over the infected region, and in exterminating the malady where it has appeared, was, during the last fiscal year, \$3,181.27. The balance of appropriations remaining available for the prosecution of this work, will be abundant for all necessities that may arise during the current year, unless, however, a serious outbreak of the trouble should occur, not now anticipated.

OLEOMARGARINE.

The introduction of the new article of manufacture known as oleomargarine, as a substitute for the genuine product of the dairy, has justly caused much dissatisfaction on the part of farmers engaged in the production of butter. Chapter 415 of the Laws of 1877, and chapter 439 of the Laws of 1880, were enacted for the protection of dairymen, and to prevent deception in the sale of butter. These statutes require that any article in semblance of butter, not the legitimate product of the dairy, and not made exclusively of milk or cream, shall have distinctly marked or stamped on each package the word "Oleomargarine." Complaint is made that these laws are constantly violated; and that large quantities of oleomargarine are sold by dealers as real butter, without the required brand. Two bills were passed by the last Legislature relating to this subject, but unfortunately, the provisions of both were in conflict with the Constitution and laws of the United States, and they were, therefore, returned to the house in which they originated without Executive approval.

It is the undoubted duty of the proper authorities to enforce the laws now existing for the protection of the dairy interests ; and also, in the interest of consumers, to prevent the sale of oleomargarine as butter. If it be found that their provisions are ineffectual, then

they should be amended in such manner as to provide stringently against all deception and fraud in the sale of an article of such universal use as butter. While the patent laws of the United States must be duly observed, there ought to be no difficulty in enacting a law that will reasonably protect the producer of natural butter, and likewise, the consumer. Oleomargarine is a product of manufacture recognized and protected by Federal statute, and its sale under the patented name cannot be interfered with by State regulation unless demonstrated to be deleterious to health. But it cannot properly be sold as butter ; and all such sales should be strictly forbidden and prevented.

RAILROAD TRANSPORTATION.

The constantly increasing development of railroad facilities enhances the importance of a fair and just regulation of freight traffic. While, to a certain extent, the competition of rival lines relieves many localities of embarrassments formerly suffered, yet the continuous absorption of the carrying trade by railways renders the effect of marked discrimination in rates all the more injurious to those against whom it operates. Experience demonstrates that increased traffic has induced cheaper rates, and but for the effect of unjust discrimination as between individual patrons and communities, there would be, perhaps, no serious cause for complaint at the present time.

Much depends in the prudent and successful conduct of many kinds of business, on the uniformity and steadiness of freight charges, and also on their general publicity. These results could easily be secured by legislation that need not be onerous to the railroads. More important still to business interests is the question of discriminating rates ; and the remedy is also, more difficult to devise. It may not, perhaps, be possible to cure the evil by arbitrary legislation ; but it ought not to be difficult, for a beginning, to afford some amelioration, leaving future experience to point out and secure complete relief.

This question was pressed upon the attention of the Legislature

in both of my former annual messages, and became the subject of much deliberation, without, however, securing definite action. There are cogent reasons why it should command your attentive consideration, and the hope is indulged that you will be enabled to devise a measure which shall afford the needed relief to patrons, and at the same time not impose unreasonable burdens on the corporations that have contributed so much to develop and enlarge the commercial facilities of the State.

STATE PRISONS.

For the first time in their history the State prisons were self-sustaining during the past year. The earnings of the convicts have sufficed for current expenses, leaving a small balance besides, to the credit of the prisons, in the treasury of the State. The average number of prisoners confined at Auburn, Clinton and Sing Sing in the last four years was as follows:

1878	3,379	1880	2,970
1879	3,062	1881	2,997

The following statement shows the amount of the earnings and expenditures on account of the several prisons for the fiscal year which closed September 30, 1881:

Sing Sing.

Earnings		\$229,254 14
Expenses		187,127 20
Surplus		<u>\$42,126 94</u>

Auburn.

Earnings	\$113,658 63	
Expenses	118,781 55	
Deficiency		\$5,123 22

Clinton.

Earnings	\$61,443 14	
Expenses	97,882 51	
Deficiency		36,439 37
		<u>41,562 59</u>
Actual surplus for the year		<u>\$564 35</u>

ELMIRA REFORMATORY.

The total number of persons received and treated at the Elmira Reformatory since it has been in operation is 1,238, of whom 753 have been discharged, leaving 485 in custody September 30, 1881. The average number of inmates during the past year was 493; and a maximum of 535 was reached in the meantime. The cost of maintenance over earnings, since the industries were inaugurated, has been as follows: For 1879, \$21,284.92; 1880, \$21,681.22; and for 1881, \$40,860.37. The marked increase for the last year is attributed to reduced production and diminished sales incident to the change from manufacture on public account, to the contract system, pursuant to the law of 1881. With the present capacity of the Reformatory, which at most can accommodate not more than 600 inmates, and the expenditure necessary to its suitable management, it is not expected that the earnings under the contract system, will equal the cost of maintenance. The indebtedness of the Reformatory, as stated by the special legislative committee last year, has all been paid, and the institution is reported to be now free from debt. The managers report that more than eighty per cent of the inmates, conditionally released, have assumed industrious and reputable habits, and that society has reasonable pledge from them of immunity from further misconduct.

HOUSE OF REFUGE FOR WOMEN.

The board of managers of the House of Refuge for Women, appointed pursuant to chapter 187 of the Laws of 1881, have purchased, at an expense of three thousand dollars, thirty acres of land within the corporate limits of the city of Hudson, as a site for the contemplated institution. The location appears to be in every way eligible for the purpose designed, and the price of the property secured must certainly be considered highly advantageous to the State. The managers are now seeking information with reference to plans for building, in expectation of proceeding at an early

day with the work of construction. One hundred thousand dollars have been appropriated for the complete and practical establishment of this institution. Thus far the managers have made a prudent use of their means; and if they succeed as well throughout, and keep within the limit of the original appropriation, as was designed, their course will be deservedly commendable, and fortunate to the State.

CHARITABLE INSTITUTIONS.

The State Board of Charities furnish information that the various charitable and other institutions coming within their purview, report expenditures for the year ending September 30, 1881, as follows:

State institutions.....	\$1,571,641
County poor-houses.....	1,170,842
City alms-houses.....	1,117,878
Orphan asylums and other homes.....	4,035,835
Hospitals.....	1,302,158
Dispensaries.....	161,946
Total.....	\$9,360,300

The following is a classification of these expenditures as far as ascertained:

Salaries and wages.....	\$1,143,351
Provisions and supplies.....	3,940,793
Clothing.....	280,671
Fuel and lights.....	317,060
Medicines and medical supplies.....	104,587
Buildings and improvements.....	984,979
Furnishing.....	142,268
Ordinary repairs.....	209,042
Indebtedness, principal and interest.....	656,693
Investments.....	484,432
Not enumerated.....	1,096,421
Total.....	\$9,360,297

The funds for the support of these institutions were derived from the following sources:

State of New York.....	\$913,044
Cities and counties.....	4,707,314
Labor of inmates.....	126,978
Paying patients.....	268,669
Donations.....	1,152,754
Income of invested funds.....	379,216
Loans.....	663,392
Non-enumerated sources.....	1,148,923
Total.....	\$9,360,300

Of State paupers in the various alms-houses there were' on September 30, 1880.....	195
Committed during the year ending September 30, 1881.....	1,373
	1,568

Discharged upon recovery.....	492
Secured employment.....	10
Absconded.....	91
Transferred to other institutions.....	13
Furnished transportation to place of legal settlement, or to their homes in other States and countries.....	745
Died.....	44
Under care September 30, 1881.....	164
	1,568

Pursuant to chapter 549 of the Laws of 1880, fifty-nine crippled, blind, lunatic and other infirm alien paupers were during the past year, removed to the countries whence they were sent, at a total expense of \$1,514.42, being an average of \$26.67 *per capita*. These persons had generally been dependent on public or private charity at home, and were destitute when landed on our shores. In every instance their shipment to this country was clearly traced to public authorities abroad, or to some society, guardian or friend. Probably not one of them would have become self-supporting, and the annual expense of maintaining them here at the moderate rate of \$2.50 per week, would have been \$7,670, aggregating a total expenditure of \$115,000 for the balance of their lives, estimated at an average of fifteen years.

The constantly increasing number of insane persons is exhibited by the following statement of the number of inmates of the various State and local asylums, poor-houses and private asylums for the past five years :

October 1, 1881.	10,059	October 1, 1878.....	8,781
1880.....	9,537	1877.....	7,921
1879.	9,015		

The new asylum for the insane, located at Binghamton, has been brought into use during the past year, and already contains a considerable number of patients.

Complaint is made on behalf of the State Board of Charities, against the managers of the State Asylum for the Insane at Utica, for neglecting to report, as required by law, a detailed and classified statement of expenditures. Compliance with this statutory provision is essential to an intelligent comparison of the management of the several like institutions, and should be rigorously enforced. It is certainly not creditable to the officers of the Utica asylum that this plain duty has been so long disregarded.

COUNTY JAILS AND POOR-HOUSES.

The attention of the Legislature has for two years, been earnestly directed to the disgraceful condition of most of the county jails and poor-houses, without securing, however, such legislation as the public interests demand. With few exceptions these institutions are discreditable to the communities responsible for their maintenance, and sadly injurious to the unfortunate classes committed to them. The commingling of the sexes, and the detention of young offenders in company with older and confirmed criminals, is obviously detrimental, and certain to result in the debasement of those who should be guarded from harmful associations while under the control of public officers.

True it is that county authorities are directly at fault for the continuance of these evils. But the State is also responsible for the well-being of its citizens; hence all the more should its authority

be exercised for the protection of the weak and unfortunate. These abuses have continued for a long series of years; and unless some legislative action be taken that will insure local reforms, no adequate relief may be expected. Authority should be lodged with some State agency, by which unfit jails and poor-houses can be condemned and the counties required to replace them with suitable structures.

CRIME.

The frequency and atrocity of murderous assaults is an alarming feature of our times. Without investigation to prove the fact, there seems to have been, during the past year, a marked increase in the number of brutal homicides. Scarcely a day passes without the publication of some horrible tragedy, generally perpetrated on weak and defenseless persons. In much the larger proportion of instances these terrible deeds are directly traceable to habits of intemperance. It is lamentable in the extreme that such condition should exist in a period of unexampled prosperity, when, to all appearances, an unusual degree of comfort and contentment abides with the great mass of our population. The reasonable certainty of punishment in recent years demonstrated, seemingly fails to arrest the tide of brutality; and little satisfaction is experienced in contemplating remedial measures for its prevention. The subject is pregnant with grave importance, and should engage the most serious consideration of all thoughtful and law-abiding citizens.

PARDONS.

The annual statement of pardons, commutations and reprieves, which will, in due time, be communicated to the Legislature, will show that the constitutional prerogative has been exercised even more sparingly than during the previous year; and notably so in comparison with former years. Considerable reflection has enforced the belief that the pardoning power was not intrusted to the Executive for the purpose of interfering with or arresting the operations

of law, either from motives of favoritism, or of pity. Should such considerations control, it would be difficult to put a bound to clemency ; and the prison doors might constantly stand open.

The Legislature, in its wisdom, has provided that convicts imprisoned for stated periods shall be entitled to commutation for good behavior. The operation of this humane law has produced marked effect in improving the conduct of prisoners, and raising the standard of discipline in the prisons. Beyond this merciful interposition it has not seemed wise to go, except in correcting what may be clearly shown to be errors of courts in the administration of justice ; or when material evidence is produced on behalf of the prisoner, to the benefit of which he is apparently entitled, but which was not available on trial. Such view is taken on the assumption that clemency was placed in the keeping of the Executive to aid in the administration of full and exact justice, and not to prevent or defeat the just and righteous enforcement of the laws.

IMPRISONMENT FOR DEBT.

Flagrant outrages against personal liberty by imprisonment for debt, are of frequent occurrence in the city of New York. Hundreds of persons are annually arrested and lodged in the county jail, and there detained until bail can be secured, which is generally difficult and often impossible for the unfortunate victims to obtain. Imprisonment for claims insignificant in amount are of no uncommon occurrence, and fifty to seventy-five prisoners are often held in detention under civil process at a time. Instances are by no means rare where individuals have thus been restrained of their liberty for several years before procuring release.

Imprisonment for debt was formally abolished by the statutes of this State many years ago ; and it has long been the pride of our civilization that no citizen should be deprived of personal freedom except on a penalty for crime or misdemeanor. To the contrary, however, this theory is not made good in practice. The truth is known that citizens are far from secure ; and as this condition of things affects more seriously the poor and friendless, all the more

necessity exists for the correction of present abuses. Every consideration of humanity demands that these wrongs shall be promptly corrected by careful amendment of the laws now in force.

INDIANS.

The gradual though constant decline in the moral and mental condition of the remnants of Indian tribes yet remaining in our State, is a subject of serious concern to intelligent citizens who have observed this unfortunate tendency. With all the opportunities for education and improvement within the reach of the young, there is little visible disposition to embrace the advantages extended; while prostitution and intemperance are making steady progress. The capacity of the Indian for education and cultivation has often been exemplified, and it seems unfortunate that, with all the privileges of our State for the improvement of the rising generation, this race of beings should be allowed to drift along in ignorance and increasing degradation. The continuance of the large reservations of land held in tribal interest, is believed to be detrimental to the material welfare of the Indians, for whose benefit they were set apart; and it seems desirable that practical investigation be undertaken to determine the feasibility of some change in policy, by severalty or otherwise, which may inure to the ultimate elevation of these wards of the State.

STATE BOARD OF HEALTH.

The operations of the State Board of Health since its organization in the spring of 1880, have fully justified the wisdom of its creation. Influences harmful to health and destructive of life, in various portions of the State, have been either modified or abated. The intolerable nuisances formerly existing at Hunter's Point and vicinity, opposite New York city, have been almost entirely removed, to the comfort and satisfaction of the surrounding communities. Malarial diseases which prostrated hundreds of people along the lines of the abandoned canals, have also been controlled and good health re-

stored. The organization of local boards of health has been greatly stimulated, with most useful results to the health of neighborhoods. In the general work prosecuted, it has been found that the statistics of the death rate in many localities are grossly defective, and it is believed that this can only be remedied by such practical amendments of the health statutes as will make the registration of deaths compulsory, and therefore, effective.

The State Board has much evidence to show that, while unusual healthfulness has continued throughout the year, certain contagious diseases, and also some preventable maladies not contagious, have caused a considerable number of deaths in various communities; and that, in each such instance, there was not at hand a competent local board of health, until the alarm of the inhabitants compelled action; whereupon the severity of diseases was speedily checked and overcome. The inefficiency of the general drainage act is noted, and the necessity for some change in it is urged to meet new conditions, and remove prevailing diseases from many localities.

Some profitable attention might also be devoted to the subject of sanitary rules in the construction of houses. The neglect to observe a proper system of drainage, ventilation and plumbing, has caused much sickness and mortality, particularly in our large cities. Any building that breeds contagious or pestilential disease, whatever its character or use, should be regarded a public nuisance; and any person who knowingly maintains such place, or omits to remove the evil defects in structure or otherwise, should be held to a rigid accountability. Many people have, from necessity, to live in tenements, or hired houses, and their lives should be as secure as those who build and occupy their own residences.

EMIGRATION.

Owing to the increased demand for labor, the number of immigrants arriving at the port of New York last year, was largely in excess of the year before. Statistics furnished by the Commissioners of Emigration show that 423,350 immigrants landed at Castle Garden from January 1 to December 10, 1881, making an increase of

114,804 over the same period the preceding year. It is estimated that the number will have increased to 440,000 by the close of the year, which will be the largest annual arrival since the organization of the Board of Emigration.

The number of arrivals during each of the last ten years was :

1872.....	294,581	1877.....	54,536
1873.....	266,818	1878.....	75,347
1874.....	140,041	1879.....	135,070
1875.....	84,560	1880.....	327,371
1876.....	68,264	1881, say.....	440,000

Although the larger proportion of this immense volume of immigration was composed of a superior character of persons, comfortably provided with means to care for themselves, yet a large number of sick and destitute have been sheltered and treated in the State Emigrant Hospitals under the care of the Commissioners, and 611 inmates still remain, including 149 insane.

The Commissioners report that notwithstanding they have exercised the strictest economy in the administration of their trust, the appropriation for the current year will prove insufficient for the support of the department, and will be quite exhausted by the first of February. They, therefore, urge the immediate appropriation of \$40,000 to provide for the balance of the year.

Nothing has yet been realized from the steamship companies, as authorized by chapter 432 of the Laws of 1881, for the payment of expenses in administering the inspection law. This law and the impost imposed for its execution have been the subject of discussion with the steamship companies; but arriving at no satisfactory adjustment, the Commissioners have found it necessary to commence suit to enforce the provisions of the statute.

QUARANTINE.

Notwithstanding the immense increase of immigration, and a larger number of arrivals from infected ports, the efficiency of the quarantine establishment at the port of New York has completely prevented the introduction of contagious diseases by incoming ves-

sels. During the early months of the year small-pox was unusually prevalent among alien passengers from various European ports, and much apprehension existed lest infected persons might pass quarantine while the disease was still latent, but which might develop among distant interior communities. Conference with the agents of passenger lines resulted in such precautionary measures as averted apprehended danger. The freedom of the State from infectious diseases, the expressed satisfaction of ship-owners and merchants with the administration of the health officer, and the security felt by the people, are gratifying evidences of the success of quarantine officials in discharging the important and difficult duties devolving upon them.

HARBOR-MASTERS AND PORT-WARDENS.

The attention of the Legislature has heretofore been directed to the fact, that the Supreme Court of the United States having declared the provision embraced in the statute of this State regulating the duties of harbor-masters, which authorizes them to collect fees in compensation for their services, unconstitutional, these officers are left without legal remuneration for services which they are still required by law to render. The magnitude and importance of the commerce of the port of New York require the constant attention of officers authorized to regulate and control the movement of vessels; and so long as the harbor-masters are continued in the discharge of these duties by the State, it is essential that they be compensated in conformity with law. Necessity also exists for legislation in regard to the jurisdiction and authority of port-wardens, which have been made somewhat uncertain by the decision of the courts.

EXCISE LAWS.

The manifest inadequacy of the laws for the regulation of the liquor traffic must be a cause of regret to all good citizens. Licenses are granted to hundreds and thousands of parties pretending to be

hotel-keepers, whose sole occupation in the way of public entertainment, consists in selling liquor; while in a still greater number of instances liquor is sold openly and boldly without license. Such common and contemptuous defiance of law is a standing reproach to the dignity and peace of the State, and ought, by every consideration of decency and morality, to be rebuked and repressed.

The evils resulting from the sale of liquor, even within the pale of the law, are bad enough, and always to be deplored; but the degradation and ruin resulting from the wholesale violation of law and order is lamentable in the extreme. Crimes most wicked and revolting, of almost daily occurrence, are attributable, in nearly every instance, to the bane of intemperance. All hope of relief from this unfortunate condition of affairs depends on judicious and effective amendments to the present laws. The highest interests of public well-being demand attention to this subject, and without causeless delay.

LOTTERIES.

Although for sixty years the Constitution has prohibited lotteries and the sale of lottery tickets in this State, and laws have been duly enacted for the purpose of enforcing such prohibition, it is notorious that the nefarious traffic still continues to flourish in the larger cities to an alarming extent. Especial efforts have been made during the past two years to impress prosecuting officers with the importance of greater vigilance in the discharge of their duties respecting this gross infraction of both constitutional and statutory law. Unfortunately, however, these efforts, with but few noteworthy exceptions, have not as yet produced satisfactory results. Penalties for the violation of these enactments should be made more severe, and the duty of various officers of the law made more specific and imperative. With an unrestricted constitutional prohibition for remedial laws to rest on, no effort should be spared to stamp out this defiant and shameful transgression of the authority of the State. The subject is worthy of consideration, and will doubtless commend itself to your attention.

MUNICIPAL AFFAIRS.

The gratifying result of last year's legislation in relation to the city of Brooklyn, effecting the complete overthrow of the political dynasty that has so long ruled the affairs of that important city to its serious detriment, affords encouragement for further efforts to relieve the city of New York of onerous burdens fastened upon her tax payers by past legislation. In 1880 an act was passed giving partial relief in this regard, and it should be supplemented still, by a further reduction of extravagant salaries and the abolition of needless offices. It is a notorious fact that the rate of compensation allowed many officials in the city of New York is far above that paid by private employers or business corporations, for like services; and while it may not be possible to secure the same economy in public expenditures as in ordinary business affairs, it is certainly practicable to approach much nearer a reasonable standard than now exists. Extravagance in the expenditure of public funds is wholly unjustifiable, and responsibility is quite as great for duties neglected as for acts performed.

Although the subject of water supply for the city of New York may be regarded as a local question, yet the fact that the metropolitan city contains one-quarter of the population of the entire State, and that the continued prosperity of that city is a matter of deep interest to all citizens, warrants some reference in this connection.

At the last session of the Legislature a bill was passed for the construction of an additional aqueduct from Croton lake to the city of New York, which, although strenuously advocated by the officers of the Croton water department, was opposed by many citizens protesting against its provisions, and it failed to receive my approval for reasons stated at length in the message accompanying its return. The occurrence during the past autumn, of a drought of unusual length and severity, causing an actual scarcity in the supply of Croton water for quite a period, and producing consequent uneasiness and alarm to residents of the city, renders it proper that careful and intelligent inquiry be made that shall definitely determine the

necessity of larger facilities, and the most feasible method for additional water supply. Affecting, as it does, the comfort and well-being of the entire population of the city, and involving the prospective expenditure of many million dollars, the suggestion is renewed that so important a question should be submitted to a commission of inquiry, to be composed of a number of the most eminent citizens of New York, whose report would command confidence and carry conviction to the community interested, as well as to the Legislature. Prompt action can secure such report in ample time for final disposition of the subject during the present session.

Should it ultimately be considered wise to undertake the construction of a new aqueduct, the inevitable expenditure of twelve or fifteen million dollars, and possibly more, makes it highly desirable that the enterprise shall be securely placed in such hands as will insure its prosecution in a strictly business-like manner, in order that the utmost economy shall be observed compatible with the early completion and permanent character of the work. Every precaution should be taken to prevent a public improvement of such magnitude being placed under a direction which, by any circumstance, is liable to be influenced by political considerations.

In recent years the city of New York has suffered outrageously from profligate administration, or downright robbery, in the construction of public works. With such grievous experience yet fresh in memory, it would be inexcusable to inaugurate a new and necessarily costly enterprise under a management that, by any possibility, could be tempted to wasteful practices in the conduct of its affairs. Nothing short of an absolute divorce from all political manipulation will avoid the danger apprehended.

INTERNATIONAL EXPOSITION.

Although the question was considerably agitated some months ago with reference to the organization of an international exposition, to be held in New York in 1883, all discussion, if not interest in the subject, has for the time being, been abandoned; and apparently every effort to accomplish the purpose has ceased. Probably the

interval of time is now too limited to make adequate provision for such an enterprise to take place as originally proposed; but considering the manifest variety of advantages to be derived from a successful exposition, which should attract the attention and co-operation of all nations, it seems highly desirable that consideration of the subject be renewed, for a later date; and that, if possible, it be put in early progress. The experience of Philadelphia, in bringing to her midst, in 1876, representatives of the entire civilized world, thus inducing every country to become patrons of her industries, was such as clearly to prove to all observers the extraordinary benefits that flow from such exhibitions. While, perhaps, in the present tide of prosperity, the merchants and manufacturers of New York do not feel the need of such stimulus, yet the time may come in the mutations of business affairs, when such benefit to their patronage as would surely inure from an international exposition, will be eagerly welcomed.

MONETARY DISTURBANCES.

The recurrence at frequent, though irregular, intervals of violent disturbances in the money market of the chief financial emporium is a matter of serious public concern. Commissions of one-sixty-fourth, one-thirty-second and one-sixteenth per cent are often paid for a single day's use of money, in addition to the legal rate of interest; while, indeed, it has not been uncommon to demand an eighth or even a quarter of one per cent. These extraordinary rates for the use of capital have been more frequent during recent years when the current rates of interest have been extremely low; and more especially since the reduction of the legal rate in this State. Violent and unnatural stringencies in monetary affairs affect not only business interests in the cities, but the farmer and manufacturer as well, in consequence of the influence on the price of all standard commodities and products.

The cause of these oft-recurring troubles is generally attributed to the influence of the usury laws of this State, which almost alone,

among all States and Nations, adheres to the confiscation of principal and interest as the penalty for usurious exactions. When quotations for the use of money in New York run up to a quarter per cent a day—being equivalent to ninety-six per cent a year—the ruling rate in Boston is usually seven or eight per cent; while nine per cent per annum is an extreme rate in that city. Massachusetts long ago repealed her laws imposing severe penalties for usury, and substituted therefor a merely nominal penalty. The difference in the rates of interest that rule respectively in Boston and New York, at periods of severe contraction, is regarded as affording the best argument for the modification of our statutes. The volume of financial transactions in the city of New York, by fully three-quarters in amount from borrowed capital, is conducted on loans payable on demand and secured by collaterals. Even if it were considered unwise to change the usury laws as applied to time loans, there can hardly be doubt of the wisdom of modifying them so far as relates to demand loans. Such amendment would afford marked relief to the great bulk of commercial operations, and would leave undisturbed the present usefulness of the laws in protecting the interests of ordinary or occasional borrowers depending on accommodations for fixed periods of time.

STATE BOUNDARY LINES.

The duty of examining and restoring the monuments marking the boundary lines between the States of New York, Pennsylvania and New Jersey, which on the part of this State was delegated to the Regents of the University by the Legislature, has been in process of accomplishment during the past year. After conference with the authorities of the States concerned, satisfactory arrangements have been made for the restoration of the missing monuments. A portion of the work on the Pennsylvania line has already been completed; and provision has been made for finishing the entire work within the next season.

THE ADIRONDACK SURVEY.

Commendable progress has been made in the survey of the Adirondack region heretofore authorized by the Legislature. An important permanent basis for all leveling work in the northern counties has been made the past season, by the location of a line of geodetic levels, carried northward from Albany through two degrees of latitude, and forming, in connection with the United States surveys, a continuous line of reference levels with monuments from New York harbor to the Canadian frontier. Valuable work has also been accomplished under the direction of the Superintendent of the Adirondack survey in relocating the boundary lines of Essex, Franklin, Hamilton, Herkimer and Lewis counties. Evidences of former surveys were generally extinct, and in one instance every vestige was obliterated for a distance of thirty-five miles. Township lines were also found to be in great confusion, rendering assessments for taxation difficult, and causing much embarrassment in the collection of taxes. Provision should be properly made for the location and permanent marking of these obscure and missing lines, so as to avoid constantly recurring difficulties, both as to local jurisdiction and the ownership of adjacent lands. The reports of the Adirondack survey have been largely sought by the public and in authorizing future publications it may be well for the Legislature to consider the practicability of having them placed on sale. It is not unlikely that the expense of publication would be partially, if not wholly met, by this means.

THE NORTHERN WILDERNESS.

Pertinent to matters relating to the survey above referred to, is a subject suggestive of practical observation in regard to the northern wilderness. The vast tract of country lying in the northern part of the State, familiarly known as the Adirondack region, has become one of the most inviting resorts to invalids and tourists. Its high altitudes, pure and bracing atmosphere, perennial streams

and mountain lakes, in the shade of primeval forests, constitute the desirable features of a retreat designed by nature for the uses of mankind in pursuit of health or pleasure. But there are other and grave interests belonging to this portion of our territory that appeal with especial force for timely consideration. By far the greater quantity of land within the Adirondack wilderness proper belongs to the State. Individual ownership is now confined to a few hundred thousand acres. Heretofore it has been the practice of the State, with questionable policy, to sell its wild lands, at nominal prices, to private parties, who have gone on, in most cases, and cut off the marketable timber where accessible, and then abandoned to the State the clearings, worthless generally for agricultural purposes; thereby escaping the payment of taxes. Forest fires have followed and raged with destructive fury, denuding the mountains and checking the flow of springs and streams that supply the navigable waters to the north, and the Hudson river southward. Furthermore, many of the lakes, the natural reservoirs of the mountain courses, have been damaged by dams and overflow, so that the shores of those lying within the working timber limits present the effects of irreparable injury. It has, therefore, become a question of serious import whether the State should any longer part with its title to land in this quarter, now held or that may hereafter revert by the non-payment of taxes. It might be leased, perhaps, with safety, for certain purposes; but its uses should be carefully restricted.

The Adirondack region is the natural and principal water-shed of important navigable waters, and, if it be divested of its timber, imminent danger will threaten. The rain-falls will diminish, the springs and streams fail, and unaccountable loss ensue to interests not immediately located in that part of the State. This subject will, indeed, sooner or later, demand inquiry, if its importance do not now compel investigation.

THE PENAL CODE.

The bill to establish a Penal Code, adopted by the last Legislature, was received at the Executive Chamber only one day prior to final

adjournment, and therefore too late for suitable opportunity to examine its provisions during the remainder of the session. Careful examination thereafter revealed several features that obviously require amendment; and if observed in time, would have been promptly indicated in order to obtain further consideration during the late session.

The date fixed for the Code to take effect on May 1, 1882, is, however, sufficiently remote to enable the Legislature to review the subject before the Act becomes operative. On account of the general merits of the measure, which was cordially approved by the legal profession as furnishing a valuable supplement to the criminal statutes, it appeared wise on the whole when the bill came from the Legislature, to complete its enactment, and rely on subsequent amendments to remove all objection. Your attention, therefore, is called to the subject, with a view of perfecting the Code in conformity with the best judgment.

CONTESTED ELECTIONS.

At every session of the Legislature, bills are introduced, and not infrequently passed, providing for the payment of claims made by persons who have succeeded to office after contesting title to the same, in cases where the ousted parties have drawn the salaries during the time they held possession. It is only just that the one elected to an office should enjoy its emoluments; but the salary ought not to be paid twice over, or to different claimants. Some plan should, therefore, be adopted whereby persons legally chosen shall be protected in their rights.

A very effective remedy for what has become a growing evil, would be to require in the case of a contested election, whether general or local, that the contestant be allowed to file with the appropriate disbursing officer a protest against payment of salary to the person who has received the certificate of election, and that the filing of such protest shall prevent payment until the incumbent furnish an adequate bond of indemnity, for a refund of the amount paid, in case the contest be decided adversely to the party holding.

This would involve no unreasonable exaction or hardship to the incumbent, while it would provide against possible injustice to the contestant. The subject is one worthy of attention, and your intelligent consideration is respectfully directed to it.

BRIBERY AT ELECTIONS.

The true theory of a republican form of government involves perfect integrity in the conduct of elections. The most dangerous enemy of free institutions is a corrupt ballot; and if government by the people ever prove a failure it will be more likely to proceed from this cause than any other. Citizens are justly indignant when frauds are committed, falsifying results, and, in effect, depriving them of the elective franchise. Carefully matured laws have been enacted to guard against these evils, and it is believed that many abuses formerly practiced have been abated. The bribery of voters, however, for which offense both the Constitution and laws provide severe penalties, is yet too common, and should be sternly rebuked.

In certain localities of the State not an election occurs, without the expenditure of large sums for the purchase of votes, and not unfrequently fabulous amounts are thus expended to control local elections. Worse than this, no pains is taken to conceal these long established crimes from public view; and they are often so notorious as to become the subject of neighborhood scandal. Prosecuting officers are sadly derelict in failing to invoke the majesty of the law so wantonly and flagrantly defied under their very eyes; for none can be so blind as not to see, or procure the evidence of these occurrences.

Unless some power intervene to put a stop to this monstrous abuse, it will inevitably grow until elections controlled by such interests as command the largest means, will become a mere farce. If such condition is reached, respect for law will be turned to contempt, and the liberties of the people endangered. Impressed with the vital necessity of checking this growing vice, you are urged to consider and adopt whatever measures may promise relief, and

especially to promote vigor and efficiency among officials upon whom the responsibility of prosecution rests.

CONGRESSIONAL REPRESENTATION.

Pursuant to the Constitution of the United States, a reapportionment of congressional district representation to conform to the census of 1880, will become necessary during your present session, provided Congress shall have completed its duty in determining the basis of representation for the several States. Unless the membership of the House of Representatives as now composed, be considerably enlarged, our State will of necessity, lose somewhat in the number of its representatives, in consequence of the relative increase in the population of other States, as established by the census; hence reorganization of congressional districts will become an absolute requirement whenever Congress shall have fixed the ratio of representation.

ARMS OF THE STATE.

The doubt and uncertainty as to what is the correct device of the Arms of the State, although not affecting our material welfare, certainly reflect upon the boasted cultivation and pride of our people. A commission designated by the Senate last year carefully investigated the subject and submitted a report to the Legislature, affording full information as to the confusion surrounding this question; and making a proper solution in a specific definition of a device, with provision recommended for an authentic exemplification thereof, to be adopted and alone used for all official documents, and letter headings, as well as for every purpose for which it may, with propriety, be employed; thus making it familiar to all. The fact that nearly one hundred different devices are extant, and that not a single person within the State is able to prove what is the true and legal design, is quite sufficient to demonstrate the desirability of some authoritative disposition of the matter

CONSTITUTIONAL AMENDMENTS.

Propositions for amending the Constitution in several respects were adopted by the last Legislature, and will, therefore, come before you this session. Those with reference to the canals are especially timely in view of possible developments in the near future, affecting this important interest. The proposed amendment for further restricting the authority of counties, towns, cities and villages to contract local indebtedness, must, in view of past experience, commend itself to the approval of the people. As to the increase in the number of Justices of the Supreme Court, there may be some question about its necessity in the Fourth and Sixth Districts; and also, the addition of more than one Justice in the Seventh and Eighth Districts, respectively.

However, as the question of amendments to the organic law is within the province of the Legislature, and the electors of the State, when not remitted, so far as the Legislature is concerned, to a duly constituted convention, the subjects detailed, rest with such authority, and must thereby be determined.

BIENNIAL LEGISLATIVE SESSIONS.

The experience of two years in the discharge of executive duties has impressed me with the belief that the interests of the people would be promoted by the adoption of the plan for biennial sessions of the Legislature. Provision for the support of all departments of the State government can be made two years in advance, quite as well as for a single year; and under the present constitutional authority with reference to extraordinary sessions of the Legislature, during which no subject can be considered not embraced in the recommendations of the Governor, no embarrassment need arise about calling such extra meetings whenever necessity demands.

This policy would undoubtedly contribute to greater stability and efficiency in regard to laws; and would check in large degree the tendency to local and special legislation now encouraged. The attention of the Legislature would more likely be devoted to

the consideration of general measures designed to conserve the public good, thus elevating the law-making power in the estimation of the people, and inducing greater respect for statutory enactments. The last revision of the Constitution provides for general legislation on many subjects; and there can be no doubt that more beneficial results in this respect would accrue if the sessions were less frequent. Several States have in recent years, changed from annual to biennial meetings, with especial advantage and satisfaction to the people.

To accomplish the object proposed, amendments to the Constitution will be required, both as to the legislative sessions and the term of service of the members. The Assembly should be chosen for two years; and if thought advisable the term of Senators might with advantage, be also lengthened. The adoption of such amendments as would meet the favor of one Legislature, would doubtless elicit discussion and consideration by the people that would furnish an intelligible guide to a succeeding Legislature in its action on the final deliberation to which the proposition would necessarily be subjected.

CONCLUSION.

Having thus, in obedience to the Constitution, communicated to you the condition of the State, permit me, in conclusion, to express my sincere desire cordially to co-operate with you, in all harmony, for the perfection of every measure designed to advance public interests, and correct existing wrongs. The responsibilities which you have assumed cannot be over-estimated. The oath you have taken will not rest lightly, with duties neglected, or trusts abused. Statutes affecting the government of the greatest of States in the Union cannot be too carefully considered. Constant, unselfish and patriotic devotion to the duties awaiting you is essential to the honorable discharge of the obligations involved. May the Ruler of Nations inspire you with wisdom adequate to the performance of your trust, and acceptably to the great constituency which you represent; that your work may redound to His glory, and to the honor and welfare of the people of this majestic Commonwealth.

ALONZO B. CORNELL.

STATE OF NEW YORK.

No. 3.

IN ASSEMBLY,

JANUARY 4, 1882.

ANNUAL REPORT OF THE COMPTROLLER.

STATE OF NEW YORK:

COMPTROLLER'S OFFICE,
ALBANY, *January 4, 1882.* }

To the Speaker of the Assembly :

SIR — I have the honor herewith to transmit to the Legislature the Annual Report, prepared by my predecessor in office, the Hon. J. W. Wadsworth, exhibiting the condition of the finances of this State at the close of the fiscal year ending September 30, 1881.

I am, respectfully,

Your obedient servant,

IRA DAVENPORT,
Comptroller.

REPORT.

STATE OF NEW YORK:

COMPTROLLER'S OFFICE,
ALBANY, *December 31, 1881.* }

To the Legislature :

In obedience to law I present, for your consideration, the following report, covering the transactions of this department for the fiscal year ending with the 30th day of September, 1881.

As in my former report, your attention is first called to the following statements which show the transactions in and the exact condition of the several trust funds belonging to the State, the revenues of which, with one exception, are devoted to educational purposes :

COMMON SCHOOL FUND.

This fund consisted of the following items September 30, 1881:

United States five per cent registered bonds, redeemable in 1881, continued at $3\frac{1}{2}$ per cent.	\$1, 445, 000 00
District of Columbia $3\frac{1}{100}$ per cent registered bonds, (\$100,000) cost.	99, 500 00
Bonds of the village of Middletown, four per cent. issued in pursuance of chapter 93, Laws of 1881,	53, 000 00
One thousand shares of Manhattan Company stock,	50, 000 00
Bonds for lands.	167, 973 90
Bonds for loans.	43, 632 37
Mortgages for loans under act of 1840, in charge of the Commissioners of the United States deposit fund.	43, 126 00
Money in the treasury.	1, 374, 369 27
	<hr/>
	\$3, 276, 601 54

Showing an increase of \$25,316 over the previous fiscal year, viz.: \$25,000 from the income of the United States deposit fund, and \$316 from the sales of land.

The following statements show the money transactions of the year :

Capital.

Receipts, viz.:

Balance in the treasury, October 1, 1880.....	\$1, 376, 135 01	
Sales of land.....	\$316 00	
Principal of bonds for lands.....	20, 912 03	
Principal of bonds for loans.....	10, 878 66	
Principal of loan of 1840.....	2, 825 00	
Received from United States De- posit Fund, revenue.....	25, 000 00	
	<hr/>	59, 931 69
		<hr/>
		\$1, 436, 066 70

Payments, viz.:

Invested in bonds village of Mid- dletown.....	\$53, 000 00	
Transferred to general fund for bonds for lands.....	8, 697 43	
	<hr/>	61, 697 43
		<hr/>
Balance in the treasury September 30, 1881..	\$1, 374, 369 27	

Revenue.

Receipts, viz.:

Interest on bonds for lands	\$11, 978 92
Interest on bonds for loans	2, 427 04
Interest on loan of 1840	2, 593 61
Interest on United States bonds.....	74, 427 33
Interest on District of Columbia bonds.....	3, 650 00
Rent of land.....	43 50
Dividends on stock of Manhattan Company....	3, 500 00
From revenue of United States deposit fund....	97, 782 73
From general fund, for interest on money used by said fund.....	79, 845 40
	<hr/>
Carried forward.....	\$276, 248 53

Brought forward.....	\$276, 248 53	
Payments, viz. :		
Deficiency of the revenue, October 1, 1880.....	\$15, 806 97	
Dividends to common schools...	245, 400 00	
School commissioners' salaries...	22, 382 73	
Indian schools.....	5, 934 71	
Premium on bond, village of Middletown.....	2, 650 00	
		292, 174 41
Deficiency of revenue, September 30, 1881,	\$15, 925 88	

LITERATURE FUND.

This fund consisted of the following items, September 30, 1881 :		
United States $4\frac{1}{2}$ per cent registered bonds.....	\$102, 600 00	
United States 5 per cent registered bonds, continued at $3\frac{1}{2}$ per cent.....	35, 000 00	
Six per cent canal deficiency stock, 1887.....	28, 000 00	
Six per cent canal deficiency stock, 1891.....	102, 000 00	
One hundred shares of Albany Insur. Co.'s stock..	4, 000 00	
Money in the treasury.....	380 76	
		\$271, 980 76

No change in the capital during the last fiscal year.

The following statements show the money transactions of the year :

Revenue.

Receipts, viz. :

Balance in the treasury, October 1, 1880.....	\$7, 115 76	
Interest on State stock.....	\$7, 800 00	
Interest on United States bonds.	6, 419 74	
Dividends on Insurance Co.'s stock.....	2, 250 00	
Interest on money in the treasury.....	9 52	
From revenue of United States deposit fund.....	28, 000 00	
		44, 479 26
Carried forward.....	\$51, 595 02	

Brought forward	\$51,595 02
Payments, viz.:	
Dividends to academies.....	\$39,910 66
For books for academies.....	3,004 53
	<hr/> 42,915 19
Balance in the treasury, September 30, 1881..	<hr/> \$8,679 83

UNITED STATES DEPOSIT FUND.

This fund consisted of the following items, September 30, 1881 :

Mortgages for loans in charge of the commissioners of the several counties, including amount invested in county bonds, in pursuance of chapter 553, Laws of 1864.....	\$2,798,409 25
Six per cent canal deficiency loan, redeemable 1891.....	52,000 00
Five per cent United States bonds, redeemable in 1881, continued at $3\frac{1}{2}$ per cent.....	721,000 00
Bonds of District of Columbia, $3\frac{1}{100}$ per cent, \$140,000, cost	137,300 00
Money in the treasury.....	305,811 46
	<hr/> \$4,014,520 71

The following statements show the money transactions of the year :

Capital.

Receipts, viz. :

Balance in the treasury, October 1, 1880.....	\$51,553 86
Principal of loans paid in.....	232,884 12
Transferred from the revenue of the fund for diminution of loans under foreclosure of mortgages	21,373 48
	<hr/>
Balance in the treasury, September 30, 1881..	<hr/> \$305,811 46

Revenue.

Receipts, viz. :

Interest on United States bonds.....	\$37,136 40
Interest on State stock.....	3,120 00
	<hr/>
Carried forward.....	<hr/> \$40,256 40

Brought forward		\$40, 256 40
Interest on loans on mortgage.....		165, 725 28
Interest on bonds, District of Columbia.....		5, 110 00
Sales of land.....		33, 001 00
For interest on money in treasury.....		4, 146 73
Transferred from general fund for deficiency...		76, 957 77
		<hr/>
		\$325, 197 18
Payments, viz. :		
Deficiency of the revenue, October 1, 1880.....		\$76, 957 77
Academies, for instruction of common school teachers.....	\$11, 395 00	
Academic examinations.....	4, 527 77	
Transferred to capital of common school fund.....	25, 000 00	
Transferred to common school fund revenue, for dividends to common schools, including sal- aries of school commissioners,	97, 782 73	
Transferred to literature fund revenue, for instruction of common school teachers, in academies, etc.....	28, 000 00	
Transferred to the capital of the fund for diminution of loans under foreclosure of mortgages,	21, 373 48	
		<hr/>
		188, 078 98
Balance in the treasury, September 30, 1881,		60, 160 43
		<hr/>
		\$325, 197 18
		<hr/>

MARINER'S FUND.

This fund consists of the following item :

Mortgage of the American Seaman's Friend So- ciety, without interest. (See chapter 37, Laws of 1845, for relief of said society.).....	\$10, 000 00
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COLLEGE LAND SCRIP FUND.

This fund consisted of the following items on 30th September, 1881:

Six per cent canal deficiency loan, redeemable in 1891.....	\$28,600 00
Six per cent United States registered bonds, redeemable in 1881, continued at $3\frac{1}{2}$ per cent...	250,000 00
Five per cent United States registered bonds, redeemable in 1881, continued at $3\frac{1}{2}$ per cent....	64,000 00
Bond and mortgage of Gleason F. Lewis, 7 per cent payable September 15, 1880, and continued ...	12,000 00
Buffalo city bonds, 7 per cent, redeemable in 1916,	22,000 00
Buffalo city bonds, 7 per cent, redeemable in 1917,	15,000 00
Albany county bonds, 5 per cent, redeemable in 1896.....	43,000 00
District of Columbia bonds, $3\frac{3}{8}$ per cent, \$35-000, cost.....	33,993 75
Money in the treasury.....	4,809 12
	<hr/>
	\$473,402 87

The following statement shows the money transactions of the year:

Revenue.

Receipts, viz.:

Interest on United States bonds.....	\$18,296 44
Interest on State stock.....	4,716 00
Interest on Albany county bonds.....	2,150 00
Interest on Buffalo city bonds.....	2,590 00
Interest on District of Columbia bonds.....	1,277 50
Interest on G. F. Lewis' mortgage.....	840 00
Interest on money in the treasury.....	130 72
	<hr/>
	\$27,000 66

Payments, viz.:

Deficiency of the revenue, October 1, 1880	\$197 19
To Cornell University.....	23,600 00
	<hr/>
	23,797 19
	<hr/>
Balance in the treasury, September 30, 1881..	\$2,203 47

BOUNTY DEBT SINKING FUND.

Balance in the treasury, October 1, 1880.....	\$3,055 80
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No change in this balance during the fiscal year ending September 30, 1881.

ELMIRA FEMALE COLLEGE EDUCATIONAL FUND.

This fund consisted of the following items, September 30, 1881 :

Oswego city bonds, 7 per cent, redeemable from 1882 to 1890.....	\$39,500 00
New York city bond, 7 per cent, redeemable in 1884.....	4,500 00
Money in the treasury.....	6,000 00
	<hr/>
	\$50,000 00

During the last fiscal year \$6,000 were received from matured Oswego city bonds, which remained uninvested Sept. 30, 1881.

There were received during the year, on account of revenue, \$3,290, and \$3,380 were paid to the Elmira Female College, leaving an apparent deficiency of \$90 in the revenue, September 30, 1881.

MILITARY RECORD FUND.

This fund consisted of the following items, September 30, 1881 :

Albany city bonds, 7 per cent, redeemable 1898 to 1900.....	\$30,000 00
Buffalo city bonds, 7 per cent, redeemable 1916 ...	9,000 00
Money in the treasury.....	121 40
	<hr/>
	\$39,121 40

The following statement shows the money transactions of the year :

Revenue.

Receipts, viz. :

Balance in the treasury, October 1, 1880.....	\$971 09
Interest on Albany city bonds.....	2,100 00
Interest on Buffalo city bonds	630 00
	<hr/>
Carried forward.....	\$3,701 09

Brought forward	\$3, 701 09
Payments:	
Rent and expenses of bureau military statistics..	2, 090 27
	<hr/>
Balance in the treasury, September 30, 1881..	\$1, 610 82
	<hr/> <hr/>

The deficiencies which existed in the revenues of the different funds at the end of the last fiscal year have been wiped-out with one exception. The deficiency of something over \$15,000 in the revenue of the common school fund still exists. In my last report the attention of the Legislature was called to the fact that, owing to the low rate of interest now obtainable in safe and legal securities, the revenue would not be sufficient for the purposes for which it was originally intended, and that the deficiency would have to be met by direct taxation. You will notice, in another part of this report, that the actual surplus in the State treasury belonging to the general fund is \$2,499,615.27, being the largest the State has ever possessed. I would suggest that \$500,000 of this amount be appropriated to increase the capital of the common school fund, and be invested in such securities as the law permits. The capital thus increased would yield an adequate income, and thereby avoid direct annual taxation, which otherwise must be necessary. The management of the United States deposit fund in the several counties has not changed for the better. The Legislature of 1881 failing to enact any law looking to its better management and its preservation, I have deemed it my duty, as the trustee of the fund, to continue the policy heretofore adopted, of requesting the return to the State treasury of all capital which may be paid in to the commissioners.

RECEIPTS AND PAYMENTS.

Aggregate balances in the treasury of all the funds of the State, October 1, 1880.....	\$3, 448, 215 38
Aggregate receipts during the fiscal year ending September 30, 1881.....	14, 940, 403 90
	<hr/>
	\$18, 388, 619 28
Deduct payments during the year.....	12, 856, 760 57
	<hr/>
Balance in the treasury, September 30, 1881...	\$5, 531, 858 71
	<hr/> <hr/>

GENERAL FUND REVENUE.

The following condensed statement gives the revenues and expenditures for the last fiscal year, showing an apparent surplus of \$1,764,664.79, on the 30th September, 1881:

Amount of receipts into the treasury during the year ending September 30, 1881 (see Schedule I),	\$8, 742, 337. 37
Amount transferred from common school fund, for bonds for lands.....	8, 697 43
	<hr/>
	\$8, 751, 034 80
Apparent deficiency, October 1, 1880,	\$430, 852 71
Amount of warrants drawn on the treasury during the fiscal year ending September 30, 1881 (see Schedule II).....	6, 394, 557 88
Amount transferred to revenue of United States deposit fund, for deficiency (chap. 1, Laws of 1881)	76,957 77
Amount transferred to the following funds for interest on money in the treasury during the year, belonging to said funds, viz.:	
Common school fund..	\$79,845 40
United States deposit fund.....	4,146 73
Literature fund.....	9 52
	<hr/>
	84,001 65
	<hr/>
	6,986,370 01
Apparent surplus, September 30, 1881.....	<u>\$1, 764, 664 79</u>

The foregoing statement presents the account of the general fund revenue as it is recorded on the books in this office, but owing to balances due from county treasurers at the close of the fiscal year, and payments on account of appropriations of 1881, included in the tax payable in 1882, the apparent surplus of \$1,764,664.79 does not represent the true state of the fund at the date indicated. The following supplementary statement gives the correct result and shows a surplus of \$2,499,615.27.

SUPPLEMENTARY STATEMENT.

Balances due from county treasurers, September 30, 1881, on State tax of 1880.....	\$247, 025 47
Add amount paid on account of 1881 appropriations, included in tax levy payable into the State treasury in April and May, 1882 (of which \$440,000 was for New Capitol).....	1, 021, 272 51
Add apparent surplus of the revenue, September 30, 1881, as shown in preceding statement.....	1, 764, 664 79
	<hr/>
	\$3, 032, 962 77
Deduct balances of 1880, appropriations unpaid and in force September 30, 1881.....	533, 347 50
	<hr/>
Actual surplus, September 30, 1881.....	<u>\$2, 499, 615 27</u>

In my report to the last Legislature, the surplus was estimated at \$1,766,513.19. The result is, therefore, \$733,102.08 in excess of the estimate, besides \$100,000 appropriated for New Capitol, per Chapter 24, Laws of 1881, from the "surplus," and hence not included in the tax levy payable during the current fiscal year. The difference between the estimate and actual result is made up largely from the receipts of taxes on corporations. The remainder is accounted for by balances of appropriations covered into the treasury by the lapse of time, and various miscellaneous receipts in excess of the estimates.

DEBT.

On the 30th September, 1880, the total funded debt was \$9,114,054.87. Classified as follows:

General fund (Indian annuities).....	\$122, 694 87
Canal.....	8, 988, 360 00
Bounty.....	3, 000 00
	<hr/>
	<u>\$9, 114, 054 87</u>

On the 30th September, 1881, the total funded debt was \$9,109,054.87. Classified as follows:

General fund (Indian annuities)	\$122, 694 87
Canal.....	8, 983, 360 00
Bounty.....	3,000 00
	<hr/>
	\$9, 109, 054 87
	<hr/>

The total reduction of the debt during the year, by cancellation, being \$5,000.

The general fund State debt is all paid, and the item of \$122,694.87, included above, represents the amount required to yield, at the rate of six per cent, the sum necessary to pay the Indian annuities. The balance of \$3,000 bounty debt for which funds are provided had not been presented for redemption at the close of the fiscal year.

The canal debt consists of the following stocks issued by the State for the purpose indicated:

Under article 7, section 1, of the Constitution.

Stock not bearing interest.....	\$6, 160 00
	<hr/>
Redeemable as follows, viz.:	
Six per cent, July 1, 1837.....	\$160 00
Five per cent, January 1, 1874.....	6, 000 00
	<hr/>
	\$6, 160 00
	<hr/>
Total canal debt, under article 7, section 1 of the Constitution.....	\$6, 160 00
	<hr/>

Under article 7, section 3, of the Constitution.

For the enlargement of the Erie, the Oswego, etc., viz.:

Stock not bearing interest	\$500 00
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For payment of canal revenue certificates:

Six per cent, July 1, 1873.....	\$500 00
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Carried forward.....	\$500 00
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Brought forward	\$500 00
Stock bearing 6 per cent interest.....	8, 976, 700 00
Redeemable as follows, viz.:	
Six per cent, January 1, 1883.....	\$638, 200 00
Six per cent, July 1, 1887.....	1, 562, 300 00
Six per cent, July 1, 1891.....	4, 302, 600 00
Six per cent, October 1, 1892.....	2, 000, 000 00
Six per cent, October 1, 1893.....	473, 000 00
	<hr/>
	\$8, 976, 700 00
	<hr/>

Total canal debt, under section 3.....	\$8, 977, 200 00
Of which there pays no interest.....	500 00
	<hr/>

Total canal debt, under section 3, paying interest.....	\$8, 976, 700 00
	<hr/>

The aggregate of the canal debt on the 30th of September, 1880 was \$8,988,360, with an aggregate unapplied balance in the sinking fund of \$2,051,480.17, leaving the real balance unprovided for, \$6, 936,879.83.

On the 30th September, 1881, the account stood as follows:

Aggregate debt	\$8, 983, 360 00
Aggregate of sinking fund.....	2, 42 , 981 57
	<hr/>
Balance unprovided for.....	\$6, 560, 378 43
	<hr/>

Showing net contribution to the canal sinking funds during the year of \$371,501.40. The actual canal debt is, therefore, \$6,560,-378.43.

EXPENDITURES FOR EDUCATIONAL PURPOSES.

The expenditures from the public treasury during the last fiscal year for these purposes were \$3,237,779.09, of which \$2,862,088.12 were the proceeds of a direct tax of one and eighty-five-one-thousandths mills for common schools.

The purposes and amounts of the several State appropriations and payments are as follows :

Academies, for dividends.....	\$42,915 19
Academies, for instruction of common school teachers	11,395 00
Common school dividends.....	245,400 00
Cornell University.....	23,600 00
Indian schools.....	5,934 71
Normal schools.....	20,683 34
School commissioners' salaries.....	22,382 73
School tax, one and eighty-five-one-thousandths mills	2,862,088 12
Elmira Female College.....	3,380 00
	<hr/>
	\$3,237,779 09
	<hr/>

The expenditures for the same period by the State for the support of asylums and hospitals for the deaf, blind, insane, idiotic, juvenile delinquents, State Reformatory and State Soldiers and Sailors' Home were \$632,614.63.

The following is a schedule of the institutions in aid, or for the support of which payments have been made from the treasury, with the amounts paid for each :

Deaf and dumb.....	\$137,328 83
Blind.....	72,557 30
Insane.....	96,201 87
Idiots.....	55,000 00
Juvenile delinquents and House of Refuge.....	140,526 63
State Reformatory.....	56,000 00
State Soldiers and Sailors' Home.....	75,000 00
	<hr/>
	\$632,614 63
	<hr/>

These amounts do not include the sums appropriated during the year for building purposes. This class of expenditure will appear in another part of this report.

PATIENTS IN ASYLUMS.

The following were the number of patients in the several asylums at the close of the fiscal years ending September 30, 1875, 1876, 1877, 1878, 1879, 1880 and 1881 :

	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Utica.....	608	561	578	606	620	614	626
Willard.....	984	1, 175	1, 270	1, 387	1, 502	1, 628	1, 735
Poughkeepsie.....	200	191	235	239	254	251	273
Middletown.....	80	83	115	150	164	180	216
Buffalo .....	...	...	...	...	...	...	156
Totals.....	1, 872	2,010	2,198	2,382	2,540	2,673	3,006

STATE PRISONS.

The following tables show the payments for all purposes on account of the prisons for the last two fiscal years, and the receipts therefrom for the same period :

For the fiscal year ending September 30, 1880.

	PAYMENTS.			Receipts.	Excess of payments.
	Mainte- nance.	Construc- tion and ex- traordinary repairs.	Total.		
Auburn	\$130,181 82	\$14,488 00	\$146,669 82	\$116,205 20	\$30,464 62
Clinton	90,782 51	*132,612 54	223,395 05	†54,855 96	168,539 09
Sing Sing	189,398 61	47,555 26	236,953 87	217,105 94	19,847 93
Supt. of Prisons, salary and expenses.....	.....	.....	7,589 34	.....	7,589 34
Agent for discharged convicts, salary and disbursements.....	.....	.....	7,500 00	.....	7,500 00
Transportation of con- victs .....	.....	.....	12,489 39	.....	12,489 39
	\$410,362 94	\$196,649 80	\$634,541 47	\$388,167 10	\$246,374 37

For the fiscal year ending September 30, 1881.

	PAYMENTS.			Receipts.	Excess of payments.
	Mainte- nance.	Construc- tion and ex- traordinary repairs.	Total.		
Auburn.....	\$121,719 88	\$3,755 00	\$125,474 88	\$118,889 13	\$11,685 70
Clinton	96,022 51	†49,399 06	147,421 57	60,935 34	86,486 23
Sing Sing	191,335 85	5,111 86	196,447 71	223,767 06	\$32,319 35
Supt. of Prisons, salary and expenses.....	.....	.....	10,529 47	.....	10,529 47
Agent for discharged convicts, salary and disbursements.....	.....	.....	8,125 00	.....	8,125 00
For additional religious instruction to con- victs.....	.....	.....	1,000 00	.....	1,000 00
Transportation of con- victs .....	.....	.....	12,486 34	.....	12,486 34
	\$411,078 19	\$58,265 92	\$501,484 32	\$403,542 13	\$97,942 79

* Construction of Clinton prison enlargement.
† Enlargement of the prison.

† Includes \$315.10 railroad receipts.
§ Surplus.

The prisons of the State show a better management than ever before. Notwithstanding the increased price of provisions the *total cost* of the prison system of the State for the fiscal year ending with the 30th day of September, 1881, is \$133,056.55 less than for the previous fiscal year, and the receipts are \$15,375.03 more. The above facts fully bear out the opinion previously expressed by me, that if the felons now confined in the penitentiaries, at an annual cost to the State of \$30,000, could be transferred to the prisons, in which there are still nine hundred and fifty vacant cells, the prison system would not only be self-sustaining but a source of revenue. This matter is again brought to the notice of the Legislature, and the passage of an act providing either for the transfer of the felons now in the penitentiaries to the prisons, or that the law now in force be amended so as to make their sentence to the prisons compulsory upon the judges and not discretionary, is earnestly recommended.

CONVICTS IN STATE PRISONS.

The number of convicts in each of the prisons September 30, 1874, 1875, 1876, 1877, 1878, 1879, 1880 and 1881, was as follows :

	1874.	1875.	1876.	1877.	1878.	1879	1880.	1881.
Auburn	1, 202	1, 312	1, 281	1, 388	1, 193	1, 103	896	903
Clinton.....	552	553	623	566	649	472	522	530
Sing Sing.....	1, 306	1, 616	1, 605	1, 613	1, 636	1, 596	1, 518	1, 518
Totals.....	3, 060	3, 481	3, 509	3, 567	3, 478	3, 171	2, 936	2, 951

NEW CAPITOL.

There was paid from the treasury for the construction, etc., of the New Capitol during the fiscal year ending September 30, 1881, as follows, viz.:

Advances to Commissioners.....	\$1, 350, 000 00
For expense of care and maintenance.....	41, 728 75
Interest on award for lands.....	600 00
	<hr/>
	\$1, 392, 328 75

There has been advanced to the Commissioners since the 1st of October, 1881, \$250,000 ; and \$11,306.36 has been paid for interest on award for lands, and care and maintenance, making the total

amount paid from the State treasury, including the purchase of lands, \$12,786,165.47 (to December 15). Of existing appropriations for construction, there remains \$210,000 subject to the draft of the Commissioners.

With the expenditure of this last amount, the "magnificent fraud," as some one has aptly termed it, will have cost the tax payers of the State, in round numbers, \$13,000,000, and the end is not yet. At the present rate of expenditure its total cost when completed will reach fully \$20,000,000, and when completed it will not meet the wants for which it was intended. Three-fifths of the building are taken up in halls and corridors, and, although it covers more than three acres of ground, all the departments of the government cannot be accommodated within it, and one or two will be forced to remain in their present quarters. A great many of its lower rooms are dark and damp, and unwholesome; the acoustics of the Assembly chamber are so bad that it is almost impossible to hear any debate; the Court of Appeals hesitates to occupy the chamber assigned it on account of the wretched manner in which it is lighted. Add to this the fact that when completed it will be an annual burden of between \$150,000 and \$200,000 for care and repairs, and that another stone may crack or crumble in the arch of the Assembly and possibly precipitate the whole to the cellar below, and the people of this State have a monument of folly, whose greatest good will be as a warning to future generations to plan well, and to calculate well the cost, before building.

AUCTION DUTIES.

The receipts from auction duties for the past fiscal year, as compared with those of the previous year, were as follows:

Year ending September 30, 1880.....	\$32, 997 97
Year ending September 30, 1881.....	31, 900 99
Decrease.....	<u>\$1, 096 98</u>

The following statement shows the amount received from auction duties for ten years, viz.:

1872.....	\$79, 069 96
1873.....	76, 499 37
Carried forward.....	<u>\$155, 569 33</u>

Brought forward	\$155,569 33
1874.....	69,756 59
1875.....	70,432 05
1876.....	75,788 00
1877.....	64,294 36
1878.....	49,673 29
1879.....	38,407 51
1880.....	32,997 97
1881.....	31,900 99

SALT DUTIES.

The report of the Superintendent of the Onondaga Salt Springs shows the following receipts and expenditures for the fiscal year, viz.:

Receipts:

From duty on salt manufactured.....	\$76,334 47
From rents, penalties and sales.....	130 00

\$76,464 47

Expenditures.....	59,470 24
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Net revenue.....	\$16,994 23
------------------	-------------

The number of bushels of salt inspected the last year was 7,633,394 against 8,481,473 the preceding year. The estimate of expenses for the ensuing year is \$60,000.

RECEIPTS AND EXPENDITURES.

The receipts into and payments from the treasury, on account of all the funds except the canal and free school fund, for the fiscal year ending September 30, 1881, were as follows:

Receipts, including balances.....	\$10,556,425 32
Payments.....	7,039,574 05

Balance in the treasury, September 30, 1881...	\$3,516,851 27
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The receipts and payments on account of the general fund revenue for the fiscal year ending September 30, 1882, are estimated as follows:

Estimated receipts.....	\$5, 962, 358 92
Estimated payments.....	4, 659, 499 08
	<hr/>
Estimated surplus, September 30, 1882.....	<u>\$1, 302, 859 84</u>

All estimated payments are based on appropriations now in force, and any that may be made by the present Legislature are not taken into account.

The details of these estimates will be found in schedule III.

STATE OF THE TREASURY.

Balance in the treasury, October 1, 1880.....	\$920, 328 16
Amount received into the treasury on account of the several funds, except the canal and free school funds, during the year ending September 30, 1881 (see Schedule I).....	9, 408, 356 66
Amount of warrants drawn on the treasury remaining unpaid September 30, 1881.....	805 78
	<hr/>
	\$10, 329, 490 60
Amount of warrants drawn on the treasury on account of the several funds during the year ending September 30, 1881 (see Schedule II).....	\$6,811, 833 55
Amount of warrants drawn on the treasury remaining unpaid September 30, 1881.....	805 78
	<hr/>
	6, 812, 639 33
Balance in the treasury, September 30, 1881 ..	<u>\$3, 516, 851 27</u>

The balances due from and to the treasury, September 30, 1881, were as given in the following statement:

From Elmira Female College educational fund revenue, deficiency	\$90 00
From common school fund revenue, deficiency....	15, 925 88
From the Treasurer, for balance in the treasury....	3, 516, 851 27
	<hr/>
	\$3, 532, 867 15
	<hr/>

To the school fund, viz. :

Capital\$1, 374, 369 27

To the literature fund, viz. :

Capital..... \$380 76

Revenue 8, 679 83

9, 060 59

To the United States deposit fund,
viz. :

Capital.....\$305, 811 46

Revenue 60, 160 43

365, 971 89

To the college land scrip fund,
viz. :

Capital.. \$4, 809 12

Revenue 3, 203 47

8, 012 59

To the bounty debt sinking fund... 3, 055 80

To the military record fund, viz. :

Capital..... \$120 40

Revenue 1, 610 82

1, 732 22

To the general fund revenue..... 1, 764, 664 79

To the Elmira Female College educational fund, capital..... 6, 000 00

\$3, 532, 867 15

TAXATION.

The following table shows the assessed valuation of the real and personal property, the rate of taxation for State purposes, and the amount of the tax of each year from 1859 to 1881, both inclusive,

1859 being the year in which the State Board of Equalization was organized and began its labors.

YEAR.	Real estate.	Personal.	Aggregate equalized val- uation.	Rate of State tax in mills on each dol- lar of valua- tion.	State tax lev- ied, including school tax.
1859.....	\$1,097,564,524	\$307,349,155	\$1,404,913,679	2 1-2	\$3,512,284 22
1860.....	.....	.....	1,419,997,520	3 5-6	5,440,640 48
1861.....	.....	.....	1,441,767,430	3 7-8	5,586,843 79
1862.....	.....	.....	1,449,803,948	4 3-4	6,884,193 75
1863.....	.....	.....	1,454,454,317	5	7,272,274 08
1864.....	1,161,750,000	399,249,877	1,560,999,877	5 1-4	7,880,249 85
1865.....	1,158,327,371	392,552,314	1,550,879,685	4 53-80	7,290,976 53
1866.....	1,196,403,416	334,826,220	1,531,229,636	5 9-16	8,517,464 85
1867.....	1,237,703,082	436,404,633	1,664,107,725	7 3-5	12,647,218 71
1868.....	1,327,403,386	438,685,264	1,766,089,140	5 4-5	10,243,317 01
1869.....	1,418,132,355	441,987,915	1,860,120,770	5 5-8	10,463,179 33
1870.....	1,532,720,007	434,280,278	1,967,001,185	7 41-156	14,285,976 55
1871.....	1,599,930,166	452,607,732	2,052,537,898	5 79-120	11,613,943 51
1872.....	1,644,379,410	447,248,035	2,088,627,445	9 3-8	19,580,882 30
1873.....	1,692,523,071	437,102,315	2,129,626,386	6 95-100	14,800,908 38
1874.....	1,750,698,918	418,608,955	2,169,307,873	7 1-4	15,727,482 06
1875.....	1,960,352,703	407,427,899	2,367,780,102	8	14,206,680 61
1876.....	2,108,325,373	357,441,401	2,466,267,273	8 11-24	8,529,174 32
1877.....	2,376,252,178	379,488,140	2,755,740,318	8 1-6	8,726,511 01
1878.....	2,373,418,490	384,980,110	2,738,378,600	2 9-10	7,941,297 94
1879.....	2,353,969,813	352,489,320	2,696,139,133	2 863-1000	7,680,416 34
1880.....	2,315,400,526	322,468,712	2,637,869,238	3 1-2	9,232,548 33
1881.....	2,340,335,690	340,921,916	2,681,257,606	2 1-4	6,032,829 61

The gross valuation of taxable property in 1871 was, \$2,052,537,898

The gross valuation in 1881 was 2,681,257,606

Increase in ten years \$628,719,708

Increase of valuation of 1881, compared with 1880, \$43,388,368

The State tax for the current fiscal year is $2\frac{1}{4}$ mills, for the following purposes :

For schools, per chapter 453, Laws of 1881..... $1\frac{14}{100}$ mills.

For general purposes, per chapter 453, Laws of 1881.. $\frac{81}{100}$ "

For canals, per chapter 595, Laws of 1881..... $\frac{2}{10}$ "

Total..... $2\frac{1}{4}$ "

The above tax of $2\frac{1}{4}$ mills is the lowest rate since 1856, and on the present valuation will yield \$6,032,829.61.

The reduction of the rate of taxation for State purposes to the above low figure is attributable to the revenue derived from the tax put upon the franchise or business of corporations by act chapter

542 of 1880, as amended by chapter 361 of 1881, and to a judicious use of the veto power by Governor Cornell. It is not a fictitious or a forced rate, but one that, even with the new tax laws now in force, can be maintained; and if the Legislature will enact into statutes some of the recommendations made by the tax commission of 1881, it will be but a few years before the entire amount necessary for the proper maintenance of the State government can be collected without levying any tax on the several counties. The amendments to chapter 542 of 1880, suggested by me, were all adopted by the tax commission, and were incorporated in a bill which eventually became the law known as chapter 361 of 1881.

In enforcing this act the department has worked hard and faithfully. Hundreds of corporations have been added to the list of last year, and the revenue which will eventually be reached under it was not overestimated in my last report at \$2,000,000. There are but two amendments that I am prepared to recommend, although another year's experience of its practical workings may enable my successor to suggest further changes in its provisions. Sections 2 and 7 of the act provide that if a corporation fails to make the *reports* required by sections 1 and 7, then the Comptroller shall "add ten per centum to the tax of said corporation," and shall proceed in the usual manner to collect such tax and the penalty. The *tax*, however, is based upon the *reports*, and if no reports are received the Comptroller practically has no amount to which he can add the ten per centum penalty.

He could undoubtedly by a long process of law arrive at the necessary facts, but I would suggest that sections 2 and 7 be amended so as to give the Comptroller authority, in each case, to have the books of the delinquent corporation examined by a competent clerk, and from them to make such reports and settle the amount of such tax as the provisions of the law require. The Legislature of 1881 also passed an act (chap. 477) amending the act of 1880 taxing foreign banks. The law as it now stands is constitutional and will undoubtedly yield a fair revenue to the State. The first receipts, in accordance with its provisions, will reach the treasury in February, 1882.

OLD BALANCES DUE FROM COUNTIES.

One other matter which was referred to in my last report, the attention of the Legislature is again called to. On entering upon

my duties on the 1st of January, 1880, the following old balances were found to be due from the several counties named:

Clinton.....	\$6,000 00
Kings.....	95,650 75
Putnam.....	1,620 90
Richmond.....	46,976 70
Schuyler.....	4,561 26

These balances arise from interest due on State tax, defalcation of county treasurers, and from other causes which continually occur in the management of the finances of a great State. The recommendation that the Legislature grant authority to the Board of Audit, after hearing proper evidence and argument, to compromise and settle these balances, is again suggested.

In closing this, my last report to the Legislature, in justice I am compelled to bear witness to the faithfulness of the Deputy Comptroller and the clerks in this department during my administration of its affairs. To their hearty response to my wishes in all things, and to their labor, often willingly performed after office hours, is due the present excellent financial condition of the State. The administration of the last two years can point with pardonable pride as the results of its labors, to the greatly improved condition of the several trust funds, to the largest surplus the treasury has ever had, and to the lowest tax rate since 1856.

J. W. WADSWORTH,
Comptroller.

SCHEDULES REFERRED TO IN THE ANNUAL REPORT OF THE COMPTROLLER.

Schedule I shows the moneys received into the treasury during the year ending 30th September, 1881.

Schedule II shows the amount of warrants drawn on the treasury during the same year.

Schedule III is an estimate of the receipts and payments for ordinary expenses of government and other purposes, for the fiscal year commencing October 1, 1881.

Schedule IV shows the amount of the 2 and 415-1000 mill tax levied in 1880 on the valuation of the real and personal estate in each county, the expenses of collection, and the amount payable into the treasury; also, the amount of unpaid taxes returned to the Comptroller's office and admitted.

Schedule V gives the names of the clerks in the public offices (except the Canal, Banking and Insurance Departments), the amount paid to each during the year, and their present salaries.

Schedule VI is an estimate of the appropriations required for the expenses of government for the fiscal year commencing on the 1st October, 1882.

Schedule VII shows the amount of duties paid by the several auctioneers of the State during the year ending 30th September, 1881.

Schedule VIII is the report made to the Comptroller by the Superintendent of the Onondaga Salt Springs.

Schedule IX gives the cost of stationery delivered to the public offices during the year.

Schedule X shows the amount of town, county, school and State taxes, and the rate of taxation, with the aggregate equalized valuations of real and personal estate in the several counties, upon the returns of 1880.

Schedule XI shows the valuations of real and personal estate in the several counties, as returned to the Comptroller's office for the year 1881.

Schedule XII shows the aggregate valuation of real and personal property, the State and local taxes, and the rate per cent for each year from 1845 to 1881, inclusive.

Schedule XIII shows the rate of State tax on each dollar of the aggregate valuation of property from 1816 to 1881, both inclusive.

Schedule XIV is a report of the treasurer of Cornell University in respect to College Land Scrip.

Schedule XV shows the amount of taxes on lands of non-residents returned for the years 1878, 1879 and 1880, with the amount thereof admitted and rejected from said returns; also the amount of said rejected taxes which have been corrected and subsequently admitted.

(I)

SCHEDULE of Moneys received into the Treasury during the year ending September 30, 1881.

Auction duty.....	\$31,900 99
Salt duty	78,408 54

Fees of Public Offices.

Secretary of State	\$9,110 55	
Comptroller	647 19	
Clerk of Court of Appeals.....	2,406 26	
State Engineer and Surveyor.....	63 60	
		<hr/>
		12,227 60
Peddlers' licenses		325 00
Sales of Natural History of the State		308 50
Tolls of Cayuga Lake inlet		37 38
Sales of general fund lands.....		7,395 48
Expenses of Commissioners of the Land Office in examining lands under water.....		1,650 00
Interest on deposits of the Treasurer.....		28,726 74
Fees of notaries.....		337 79
Tax on corporations.....		992,725 16
Unexpended balance of uniform and regimental funds returned from Cayuga county.....		862 28
Paid by United States to reimburse expenses of the late war.....		21,421 13
Clerk hire returned by Department of Public Instruction.....		183 34
Balance returned by commissioners to revise banking laws.....		345 90
State tax, exclusive of one and eighty-five thousandths mills tax for common schools (for amount of tax levied in 1880 see Schedule IV).....		6,309,885 88

State Prison Earnings.

Auburn.....	\$113,839 13	
Clinton	60,935 34	
Sing Sing.....	228,767 66	
		<hr/>
		403,542 13
Asylum for Insane Convicts... ..		10,564 41

Carried forward..... \$7,900,838 25

Brought forward..... \$7,900,838 25

Miscellaneous Receipts Returned to the Treasury.

Balance of Assembly contingent fund...	\$250 00	
Balance of special appropriations to Clinton prison.....	5,755 28	
For gas-works at Auburn prison.....	5,000 00	
Erroneous redemption of land.....	18 57	
Transportation returned by United States ordnance storekeeper.....	21 32	
Balance of appropriation for cleaning Old Capitol.....	31 47	
Balance of redemption of State lands sold in Oneida county.....	84 69	
Balance of non-resident taxes for roads in Hamilton county.....	170 42	
		11,331 75
From trespassers on State lands.....		606 02
Stationery sold.....		756 06
Lease of Chateaugay railroad.....		1 00
Unclaimed checks.....		227 10

Moneys Received on Account of Previous Advances, or to be Paid from the Treasury.

Temporary loan in anticipation of State tax..... 500,000 00

Non-resident Taxes.

Arrears of taxes.....	\$86,727 05	
Interest.....	28,979 97	
Redemption of lands.....	6,067 46	
Sales for taxes.....	9,511 01	
Interest on sales.....	2,125 18	
For advertising.....	1,067 18	
		134,477 85
Bank Department, for expenses.....		19,865 11
Insurance Department, fees.....		147,516 01
Railroad companies, for salary of deputy State Engineer, clerk hire and printing.....		10,339 73
Gas-light companies, for salary and expenses of inspector of gas-meters.....		2,528 47
Public administrators.....		13,850 02

Total receipts on account of general fund..... \$8,742,837 37

On account of common school fund :

Capital.....	\$59,931 69	
Revenue.....	196,403 13	
		256,334 82

Carried forward..... \$8,998,672 19

Brought forward.....	\$8,998,672 19	
On account of the literature fund :		
Revenue.....		44,469 74
On account of the United States deposit fund :		
Capital.....	\$232,884 12	
Revenue.....	321,050 45	
		553,934 57
On account of the college land scrip fund :		
Revenue.....		27,000 66
On account of Elmira Female College fund :		
Capital.....	\$6,000 00	
Revenue.....	3,290 00	
		9,290 00
On account of military record fund :		
Revenue.....		2,730 00
		<u>\$9,636,097 16</u>

(II.)

*SCHEDULE of Warrants drawn on the Treasury during the year ending September 30, 1881.**Executive Department.*

Governor, for salary.....	\$10,833 34	
Lieutenant-Governor, salary.....	5,416 68	
Private secretary to the Governor... ..	3,791 68	
Compensation of clerks and messengers in the Executive Department.....	10,681 18	
Repairs, etc., for Governor's residence..	3,186 48	
Incidental expenses of the government..	3,481 78	
		\$37,391 14

Court of Appeals.

Judges of the court, for salaries.....	\$61,875 00	
Allowance for expenses	17,500 00	
		79,375 00
State Reporter, for salary	\$6,250 00	
Compensation of clerk in Reporter's office	2,166 66	
		8,416 66
Clerk of the court.....	\$5,416 68	
Deputy Clerk.....	3,250 00	
Compensation of clerks and messenger in office of the Clerk	5,308 34	
Pay of crier and attendants of the court,	7,085 00	
Books for library of the court.....	1,280 91	
Office expenses of the Clerk	2,360 59	
		24,701 52
Carried forward.....		\$149,884 32

Brought forward..... \$149,884 32

Supreme Court.

Justices of the Court:

First district, salaries	\$37,500 00	
Second district, salaries... \$43,750 00		
expenses.. 7,500 00		
	51,250 00	
Third district, salaries.... \$29,000 00		
expenses... 5,800 00		
	34,800 00	
Fourth district, salaries... \$30,000 00		
expenses.. 6,000 00		
	36,000 00	
Fifth district, salaries \$35,716 66		
expenses... 5,963 34		
	41,680 00	
Sixth district, salaries.... \$30,000 00		
expenses .. 6,000 00		
	36,000 00	
Seventh district, salaries.. \$33,000 00		
expenses. 6,000 00		
	39,000 00	
Eighth district, salaries... \$30,000 00		
expenses.. 6,000 00		
	36,000 00	
Stenographers of court, second district..	4,125 00	

Supreme Court Libraries.

Second district	\$2,600 00	
Fourth district	600 00	
Fifth district.....	2,082 52	
Sixth district.....	719 34	
Eighth district	201 50	
	6,203 36	
Expenses of general terms of the court..	3,039 09	
Reports of courts for distribution	409 20	

326,006 65

Attorney-General's Office.

Attorney-General, for salary.....	*\$6,250 00	
Deputy	4,333 34	
Second deputy....	4,333 34	
Compensation of clerks and messenger..	5,000 04	
Stenographer.....	1,916 68	
Expenses of the office.....	723 24	
Books for library.....	524 50	
Services and expenses of counsel in various suits.....	3,150 00	

Carried forward..... \$26,231 44 \$475,890 97

* NOTE.—The salaries due for the quarter ending September 30, have heretofore been paid on the first of October. That rule was departed from this year, and the salaries were paid September 30, within the fiscal year during which the services were rendered, hence the apparent overpayment of salaries.

Brought forward.....	\$26,231 14	\$475,890 97
Costs, expenses and sheriff's fees.....	967 40	
Costs and expenses in judgment recovered against the State.....	6,748 61	
		33,947 15

Office of Secretary of State.

Secretary of State, salary	\$6,250 00	
Deputy Secretary	3,791 68	
Compensation of clerks and messenger..	21,092 50	
Expenses of the office.....	2,779 45	
		33,913 63

Comptroller's Office.

Comptroller, salary.....	\$7,500 00	
Deputy Comptroller.....	4,333 34	
Compensation of clerks and messenger..	28,404 08	
Expenses of the office.....	2,892 07	
		43,129 49

Treasurer's Office.

Treasurer, salary	\$6,250 00	
Deputy Treasurer.....	3,791 68	
Compensation of clerks and messenger..	8,508 35	
Expenses of the office.....	794 65	
		19,344 68

Department of Public Instruction.

Superintendent's salary	\$5,416 68	
Deputy Superintendent.....	3,791 68	
Compensation of clerks and messenger,	9,721 68	
Expenses of the office.....	2,016 55	
		20,946 59

Office of State Engineer and Surveyor.

State Engineer, salary.....	\$5,000 00	
Compensation of clerks.....	3,791 68	
Expenses of the office.....	800 79	
		9,592 47

Land Office.

Survey and appraisal of land.....	\$541 94	
Examining lands under water.....	129 44	
Restraining trespassers, serving notices, etc.....	1,033 61	
Printing, lithographing and advertising	428 76	
Perfecting title and assessment.....	268 10	
		2,401 85
State survey.....		15,500 00
Adirondack survey.....		10,000 00

Carried forward..... \$664,666 83

Brought forward.....	\$664,666 83
Settlement of boundary line between New York and Pennsylvania.....	1,000 00
Printing report of Regents on boundaries of the State..	1,000 00
Improving the navigation of the Hudson river.....	24,969 42
Improving New York harbor by providing stone monuments, station marks, etc., and placing them on Staten Island.....	1,226 81
Improving navigation of Cayuga lake inlet.....	5,478 05
Removing intruders from Indian lands.....	215 00

Public Offices.

Postage on letters, etc.:	
Governor.....	\$386 00
Secretary of State.....	1,123 73
Comptroller.....	741 09
Treasurer.....	112 86
Attorney-General.....	216 76
Department of Public Instruction.....	414 12
State Engineer and Surveyor.....	147 96
Clerk of Court of Appeals.....	575 52
Adjutant-General.....	407 08
Inspector-General.....	80 00
	<hr/>
	4,205 12
Stationary for the public offices.....	3,424 29
Fuel for Capitol, State Hall and State Library....	3,644 21
Transportation of packages, including boxes.....	2,435 84

Capitol.

Compensation of superintendent.....	\$1,300 00
Gas, water and ice.....	1,550 00
Repairs, cleaning and other expenses....	8,591 53
	<hr/>
	11,441 53

State Hall.

Compensation of Superintendent.....	\$1,300 00
Gas, water and ice.....	1,527 50
Repairs, cleaning and other expenses...	5,501 12
	<hr/>
	8,328 62

New Capitol.

Advances to Commissioners.....	\$1,350,000 00
Expenses.....	41,728 75
Interest on award for lands.....	600 00
	<hr/>
	1,392,328 75
Carried forward.....	<hr/>
	\$2,124,364 47

Brought forward..... \$2,124,364 47

State Library.

Librarians and janitor, salaries.....	\$8,975 04	
For purchase of books.....	4,202 70	
Binding, lettering, etc.....	2,216 73	
Cleaning, repairs, gas, etc....	3,000 24	
	<hr/>	18,394 71

Regents of the University.

Secretary, for salary.....	\$2,708 34	
Assistant secretary.....	2,166 68	
Contingent expenses.....	4,132 46	
	<hr/>	9,007 48

New York State Museum of Natural History.

Director, for salary.....	\$3,500 00	
State Entomologist.	2,166 68	
Botanist	1,625 00	
Taxidermist.....	250 00	
Salaries of assistants.....	2,865 03	
Increase and preservation of the Cabinet,	3,387 72	
Superintendent of hall for State Cabinet..	1,300 00	
Gas, water and ice.....	359 75	
Repairs, cleaning, fuel and other expenses,	3,802 82	
	<hr/>	19,257 00

Natural History.

James Hall, authorship, clerk-hire, etc..	\$3,125 00	
Drawings.....	1,809 50	
Printing and lithographing.....	13,100 28	
	<hr/>	18,034 78

Legislature.

Compensation of officers and members..	\$336,205 62	
Advances to clerks for contingent ex-		
penses:		
Senate.....	\$4,870 18	
Assembly.....	13,327 54	
	<hr/>	18,197 72
Committees, for clerks and		
expenses	\$28,876 47	
Award for printing pro-		
ceedings of Assembly		
committee of 1879 on		
railroads.	14,500 00	
	<hr/>	43,376 47
Carried forward.....	\$397,779 81	\$2,189,058 44

Brought forward.....		\$2,189,058 44
Compensation of witnesses.....	567 46	
Postage:		
Senate.....	\$1,573 02	
Assembly.....	4,555 97	
	<hr/>	6,128 99
Pay of chaplains.....	917 00	
Twelve hundred copies Clerk's Manual..	1,000 00	
Legislative Manual.....	1,480 29	
Award of Board of Audit to Weed, Parsons & Co., for legislative printing 1879 and 1880.....	26,424 24	
For 2,200 copies of Civil List	5,500 00	
And 6,000 copies of report of Adirondack survey.....	12,000 00	
Expenses of reception of General Grant.	207 33	
Clerk of Senate, for indexing journals, bills, etc.....	500 00	
Clerk of Assembly, for indexing journals, bills, etc.....	750 00	
Preparing and mailing Clerk's Manual..	250 00	
Extra clerical services and engrossing..	750 00	
A. S. Draper, expenses of contested election in second Assembly district, Albany county.....	750 00	
American District telegraph.....	100 00	
Books for Assembly.....	63 00	
Furniture, Senate and Assembly.....	127 00	
Cartage of documents....	600 00	
Removing Senate library to New Capitol.	529 00	
Transportation of packages by express:		
Senate.....	\$811 89	
Assembly.....	2,662 14	
	<hr/>	3,474 03
		459,898 16

Printing for the State.

Legislative.....	\$16,995 72	
Publishing official canvass.....	347 50	
Publishing official notices.....	1,655 20	
Publishing concurrent resolutions.....	13,908 11	
Publishing Session Laws of 1880.....	4,474 50	
Printing slips of Session Laws of 1881..	1,313 82	
Publishing rules of practice, supreme court.....	283 50	
Printing school registers.....	1,755 00	
Printing testimony in charges against the late sheriff of New York.....	255 95	
Printing 12,500 copies of Election Code.	2,500 00	
Binding legislative documents.....	1,136 26	
Binding Session Laws, 1881.....	1,195 90	
	<hr/>	45,821 46

Carried forward..... \$2,694,778 05

Brought forward..... \$2,694,778 05

Militia of the State.

Adjutant General's office:
 Services..... \$14,850 42
 Expenses..... 2,738 55
 Copying muster-rolls 4,172 58
 Investigating war claims
 against the United States 71 30

\$21,832 85

Printing and binding report of 1868.... 13,052 93

Expenses of commissioners to revise
 Military Code..... 2,399 72

Examining board and camp of instruc-
 tion..... 247 63

Inspector-General's office:

Services..... \$6,030 00
 Expenses..... 1,649 72

7,679 72

Paymaster, services and expenses..... 313 15

Inspector of Rifle Practice:

Services..... \$1,500 00
 Expenses..... 3,554 01

Cost of maintaining rifle
 ranges..... 7,908 64

Prizes..... 1,057 00

14,019 65

Commissary-General of Ordnance:

Services..... \$20,554 69
 Expenses..... 12,536 33

Purchases..... 4,816 97

Transportation..... 7,204 06

Equipment of new companies, 1,519 00

Replacing property at James-
 town armory which was
 burned..... 1,264 00

47,895 05

Expenses of review of first division.... 3,670 00

Award for military goods furnished
 twenty-seventh regiment..... 3,953 50

Judge-Advocate, services and expenses.. 500 00

Expenses of courts-martial and court of
 inquiry..... 1,483 80

Expenses of brigade and division head-
 quarters..... 12,178 27

Regimental fund..... 60,056 58

Uniform and equipment fund..... 94,528 00

Carried forward..... \$283,810 85 \$2,694,778 05

Brought forward.....	\$283,810 85	\$2,694,778 05
Restoring property burned in Albany arsenal.....	\$1,095 67	
Improvement of Albany ar- senal.....	2,371 01	
Repairing damage at Syra- cuse arsenal.....	3,037 14	
Award for building New- burgh armory.....	3,049 26	
Award for building Water- town armory.....	8,348 00	
Repairs of arsenals.....	3,744 51	
	<hr/>	
	21,645 59	
		<hr/>
		305,456 44

Indian Affairs.

Compensation of agents and attorneys..	\$865 00	
Physician for Onondagas.....	300 00	
School-house for Tonawandas.....	300 00	
Indian annuities.....	7,361 67	
	<hr/>	
		8,826 67

Quarantine.

Support and repair of quarantine station,	\$20,815 00	
Repair of hospital ship.....	835 00	
Salaries of Commissioners.....	7,500 00	
	<hr/>	
		29,150 00

Commissioners of Emigration.

Paid to Commissioners on account of appropriations...	159,334 94
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Promotion of Agriculture.

Societies of the several counties.....	\$13,218 68	
American Institute.....	2,315 63	
New York State Society.....	6,206 25	
Indian societies.....	499 98	
	<hr/>	
		22,240 54

Commissioners of Fisheries.

Seth Green, for salary and expenses incurred in the service of the Commissioners.....	9,220 32
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Onondaga Salt Springs.

Advances made to Superintendent on his estimates of expenditures.....	\$60,864 41	
Expense of inquiry into the management of the springs.....	20 02	
	<hr/>	
		60,884 43

Carried forward.....	\$3,289,891 39
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Brought forward..... \$3,289,891 39

Normal Schools.

Albany.....	\$84 44	
Brockport.....	12,300 97	
Fredonia.....	6,297 93	
Oswego.....	2,000 00	
		20,683 34

State Board of Audit.

Stenographer's salary.....	\$541 68	
Expenses.....	96 30	
		637 98

State Board of Health.

Secretary, salary.....	\$3,250 00	
Clerk hire.....	2,239 50	
Expenses.....	5,432 75	
Members' traveling expenses.....	778 52	
		11,700 77
Auction agent, salary and expenses.....	1,441 04	
Superintendent of weights and measures.....	625 00	
Tax on corporations, erroneous payments returned...	4,550 85	
Electors of President and Vice-President.....	3,070 65	
Commissioners to revise banking laws.....	1,537 00	
Commission on taxation.....	13,169 75	
Agricultural experiment station.....	1,597 81	
State Assessors, salaries and expenses.....	8,094 72	
Washington's head-quarters, compensation of superintendent.....	1,000 00	
Prevention of contagious and infectious diseases of animals.....	3,181 27	
Shore inspector, salary and expenses.....	4,125 00	
Pilot commissioners, expenses.....	4,500 00	
Game and fish protectors, salaries and expenses.....	5,536 82	

Temporary Loan.

Loan made in anticipation of State tax..	\$500,000 00	
Interest.....	3,389 72	
		503,389 72

State Tax.

Proceeds of 34-100 mill tax levied in 1880, to provide for deficiency in the canal sinking fund.....	878,938 03
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Commissioners of Public Charities.

Salaries of secretary and assistant.....	\$5,958 36	
Expenses of commissioners.....	1,301 42	
Carried forward.....	\$7,259 78	\$4,757,671 14

Brought forward.....	\$7,259 78	\$4,757,671 14
Expenses of secretaries in visiting almshouses, removal and care of State paupers.....	1,126 39	
Rent, office and contingent expenses....	2,536 60	
Support, treatment and removal of State paupers.....	46,761 40	
		57,684 17

Commissioner in Lunacy.

Salary.....	\$4,000 00	
Expenses.....	958 59	
		4,958 59

Charitable Institutions—Insane—State Lunatic Asylum at Utica.

Salaries of officers.....	\$15,000 00	
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Willard Asylum.

Salaries of officers.....	\$11,447 22	
Building.....	13,000 00	
Furniture, sewers, grading, etc.....	10,000 00	
Support of Mark Jack, an insane Indian.....	151 20	
		34,598 42

Buffalo State Asylum.

Support.....	\$27,554 59	
Salaries of officers.....	4,028 26	
		31,582 85

State Homœopathic Asylum.

For building and furnishing a pavilion for female patients.....	\$88,908 26	
Salaries of officers.....	12,000 00	
		100,908 26

Hudson River State Hospital.

Salaries of officers.....	\$7,647 60	
Support.....	5,000 00	
		12,647 60

Binghamton Asylum.

Salaries of officers.....	\$1,373 00	
Support.....	2,000 00	
Construction.....	25,000 00	
		28,373 00

223,110 13

Carried forward..... \$5,043,424 03

Brought forward..... \$5,043,424 03

New York Institution for the Blind.

For support and instruction of pupils... \$40,557 30

*New York State Institution for the Blind
at Batavia.*

Support and instruction of

pupils \$30,000 00

Repairs and furniture..... 2,000 00

32,000 00

72,557 30

Institutions for the Deaf and Dumb.

Institution at New York, for support
and instruction of pupils..... \$59,461 89

Improved instruction of deaf-mutes,
support..... 14,465 24

Le Conteuix Institution, support..... 13,615 87

Central New York Institution, support.. 22,267 05

St. Joseph's Institute, support..... 12,444 82

Western New York Institution, support, 15,073 96

137,328 83

Thomas Asylum.

For support of orphan and indigent In-
dian children..... \$8,486 37

Repairs and hospital..... 1,725 00

10,211 37

New York State Soldiers and Sailors' Home.

For support..... \$70,000 00

Construction of additional hospital..... 5,000 00

Farm stock and implements, repairs, etc. 5,000 00

80,000 00

State Asylum for Idiots.

Support..... \$45,000 00

Support of custodial branch..... 10,000 00

55,000 00

Seamen's Retreat Hospital.

For support 4,051 56

State Reformatory at Elmira.

To pay indebtedness..... \$50,000 00

For support 6,000 00

56,000 00

Carried forward..... \$5,458,573 09

Brought forward \$5,458,573 09

Society for Reformation of Juvenile Delinquents.

For support	\$69,999 97	
Additions to and alteration of buildings.	6,360 00	
		<hr/> 76,359 97

House of Refuge.

For support	\$64,166 66	
Erection of additional building	17,600 00	
		<hr/> 81,766 66

Asylum for Insane Convicts, Auburn.

Support	\$27,016 29	
Repairs	2,375 00	
		<hr/> 29,391 29

State Prisons — Auburn.

Support	\$119,219 83	
Water for prison and asylum for insane convicts..	2,500 00	
Rebuilding and repairing battlements	500 00	
Special repairs	3,255 00	
		<hr/> 125,474 83

Clinton.

Support	\$98,022 51	
Enlargement	49,399 06	
		<hr/> 147,421 57

Sing Sing.

Support	\$189,835 85	
Water	1,500 00	
Repairs	5,111 86	
		<hr/> 196,447 71
Salary and expenses of superintendent..	9,529 47	
Clerk hire	1,000 00	
Agent for discharged convicts, salary	\$3,125 00	
Expenses	5,000 00	
		<hr/> 8,125 00
For additional religious instruction to convicts	1,000 00	
Transportation of convicts	12,486 34	
		<hr/> 501,484 92
Carried forward	\$6,147,575 93	

Brought forward..... \$6,147,575 93

Penitentiaries.

For support of convicts and for money and clothing furnished discharged convicts at penitentiaries :

In Albany county.....	\$2,567 73	
In Erie county.....	2,854 07	
In Kings county.....	9,983 18	
In Monroe county.....	1,683 29	
In New York county.....	10,301 06	
In Onondaga county.....	2,610 67	
		30,000 00

Miscellaneous and Temporary Expenses.

M. J. Power, repairing monument commemorating capture of Major Andre..	\$1,000 00	
For Saratoga Monument Association...	6,373 81	
For sewer on lands, in Syracuse, owned by the State in 1877.....	2,478 76	
Removing causes of malaria from Chemung canal.....	2,240 01	
Increasing water supply of middle division of Erie canal.....	1,000 00	
Contractors' deposits return.....	300 00	
Memorial of battle of Cowpens.....	250 00	
E. A. Hodgson, for deaf-mutes journal..	775 00	
Books to replace those destroyed by fire in town of Bangor....	\$48 50	
Books to replace those destroyed by fire in town of Bombay.....	48 50	
Books to replace those destroyed by fire in town of Clare.....	50 00	
Books to replace those destroyed by fire in town of Wolcott.....	41 00	
	188 00	
		14,605 58

Moneys advanced and refunded, which had been previously paid, or were to be paid, into the treasury:

Bank Department.

Superintendent, for salary.....	\$5,416 68	
Deputy Superintendent.....	3,684 74	
Clerk hire.....	6,093 84	
Expenses of bank examinations, printing, etc.....	4,098 81	
		19,294 07
Carried forward.....		\$6,211,475 58

Brought forward..... \$6,211,475 58

Insurance Department.

Superintendent, for salary.	\$7,583 34	
Deputy Superintendent.	4,875 00	
Counsel.....	3,999 96	
Clerk hire.....	47,046 85	
Night watchman.....	120 00	
Office expenses, examining insurance companies, printing, postage, etc.	58,467 96	
	<hr/>	122,093 11

Gas-light Companies.

Salary and expenses of inspector of gas meters....	3,125 00
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Railroad Companies.

Salary of Deputy State Engineer and Surveyor.....	\$3,791 68	
Clerk hire.....	3,981 68	
Printing report of 1879.....	10,175 00	
Blanks, postage, transportation, etc....	194 25	
	<hr/>	18,142 61

County Treasurers.

For taxes on non-resident lands, returned to the Comptroller's office, and county treasurers' fees.....	\$27,634 32	
Expenses of tax sale.....	948 52	
Refunded :		
Redemption of lands sold for taxes.....	3,690 17	
Erroneous payment of taxes.....	4,440 55	
Taxes for roads	3,008 02	
	<hr/>	39,721 58

United States Deposit Fund.

For deficiency in the revenue of this fund, September 30, 1880.....	76,957 77
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Total payments on account of the general fund..	\$6,471,515 65
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On account of the common school fund:

Capital.....	\$53,000 00	
Revenue.....	276,367 44	
	<hr/>	329,367 44

On account of the literature fund:

Revenue....	42,915 19
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On account of the United States deposit fund:

Revenue.....	166,705 50
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Carried forward.....	\$7,010,503 78
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Brought forward	\$7,010,503 78
On account of college land scrip fund :	
Revenue.....	23,600 00
On account of Elmira college fund :	
Revenue.....	3,380 00
On account of military record fund :	
Revenue.....	2,090 27
	<hr/>
	\$7,039,574 05
	<hr/>

(III.)

ESTIMATED REVENUE

*Applicable to the ordinary expenses of Government and other purposes,
for the fiscal year commencing October 1, 1881.*

Eighty-one one-hundredths ($\frac{81}{100}$) of a mill tax, for support of government.....	\$2,171,818 66
Balances due from county treasurers, September 30, 1881, on tax of 1880	247,025 47
Taxes on corporations.....	1,000,000 00
Auction duty.....	30,000 00
Salt duty.....	75,000 00
State prison earnings.....	375,000 00
Arrears and interest of non-resident taxes.....	100,000 00
Fees of public offices.....	10,000 00
Peddlers' licenses	300 00
Interest on treasury deposits.....	20,000 00
Sale of lands.....	5,000 00
From banks, for expenses of Bank Department.....	18,000 00
From insurance companies, for expenses of Insurance Department.....	100,000 00
From railroad companies, for salary of Deputy State Engineer and Surveyor, clerk hire and printing reports.....	18,000 00
From gas-light companies, for salary of inspector of gas-meters.....	2,500 00
Asylum for Insane Criminals, paid by counties.....	10,000 00
Fees of notaries.....	300 00
Special tax to pay additional compensation of justices Supreme Court, Second District, stenographer in said district, and salary of shore inspector.....	12,250 00
Miscellaneous.....	2,500 00
	<hr/>
	\$4,197,694 13
	<hr/>

ESTIMATED PAYMENTS

For ordinary expenses of Government and other purposes, for the fiscal year commencing October 1, 1881.

Salaries of the officers of government, and of the clerks in the public offices.....	\$192,522 25
Salaries of the judges of the Court of Appeals, and expenses.....	63,500 00
Salaries of the justices of the Supreme Court, and expenses.....	246,800 00
For additional law libraries.....	6,291 46
Expenses of the General Term, Supreme Court.....	4,960 91
Compensation of members and officers of the Legislature.....	386,367 80
Contingent expenses of the Legislature.....	33,346 82
Expenses of the public offices.....	13,646 39
Expenses of the Executive Department.....	3,095 55
Apprehension of criminals.....	1,500 00
Apprehension of fugitives from justice.....	1,500 00
Compensation of the criers and attendants of the Court of Appeals.....	6,139 00
Advances to county treasurers for taxes on non-resident lands returned to the Comptroller's office....	60,000 00
Insurance Department, salaries and expenses.....	99,057 65
Bank Department, salaries and expenses.....	22,041 15
Inspector of gas-meters, for salary.....	2,500 00
Office of State Engineer and Surveyor, railroad department.....	16,503 54
Agent to examine auctioneer's accounts.....	1,319 46
Repayment of money to purchasers for redemption of lands sold for taxes.....	30,000 00
Repayment of money erroneously paid for taxes.....	5,000 00
Repayment of money in cases of failure of title to lands sold by the State.....	600 00
Repayment of money paid into the treasury through mistake.....	803 50
Quarantine commissioners, for salaries and expenses..	30,850 00
Expenses of public lands and compensation and mileage of the Speaker of the Assembly, as Commissioner of the Land Office.....	1,399 14
Postage of official letters.....	7,648 00
Stationery for the public offices.....	6,964 03
Transportation of the journals and documents of the Legislature, packages for the public offices, and expense of boxes.....	5,470 16
Expenses of the Regents of the University, and salaries of the secretary and assistant secretary, etc.....	10,167 23
Expenses of the Capitol.....	8,734 47
Expenses of the State Hall.....	10,171 38

Carried forward..... \$1,278,899 79

Brought forward.....	\$1,278,899 79
Expenses of the State Library.....	21,896 35
Repairs, etc., of the Executive Mansion.....	7,955 83
Expenses of the Hall for the State Cabinet of Natural History.....	5,194 84
Natural History of the State, for drawings, etc.....	3,600 00
James Hall, as State Geologist, for compensation for authorship, etc.....	2,500 00
New Capitol.....	460,000 00
New Capitol, maintenance.....	56,156 25
Expenses of the State prisons.....	573,990 75
Repayment of the State prison contractors' deposits..	500 00
Transportation of convicts.....	22,513 66
Superintendent of State Prisons, for salary, expenses and clerk hire.....	10,256 71
Expenses of Asylum for Insane Criminals.....	30,596 03
Maintenance of convicts confined in penitentiaries...	30,000 00
Expenses of the National Guard, etc.....	435,238 65
Expenses of the Onondaga salt springs.....	65,729 98
Agricultural societies.....	35,195 24
Indian affairs.....	1,230 00
Pilot commissioners.....	4,500 00
Compensation of the keeper of Washington's headquarters, repairs to property, etc.....	1,000 00
Reports of the Court of Appeals and Supreme Court, for exchange with other States.....	876 30
Printing for the State.....	70,462 87
Fuel for the Capitol, State Hall and State Library...	5,450 58
Costs of suits, expenses of Attorney-General, etc.....	6,505 46
New York State Museum of Natural History.....	10,263 61

Charitable Institutions, etc.

Hudson River State Hospital for the Insane.....	\$10,000 00
Willard Asylum for the Insane.....	15,500 00
Buffalo State Asylum for the Insane..	41,442 91
Lunatic Asylum, Utica.....	18,750 00
Binghamton Asylum for Chronic Insane	56,562 50
New York Institution for the Blind..	55,160 16
New York State Institution for the Blind, Batavia.....	55,000 00
Institution for the Deaf and Dumb, New York.....	72,800 00
Institution for Improved Instruction of Deaf-Mutes, New York.....	21,712 91
Central New York Institution for Deaf-Mutes, Rome.....	30,937 50

Carried forward..... \$407,865 98 \$3,140,513 00

Brought forward.....	\$407,865 98	\$3,140,513 00
Le Couteulx St. Mary's Institution for the Improved Instruction of Deaf- Mutes at Buffalo.....	20,812 50	
Western New York Institution for Deaf-Mutes, Rochester.....	20,803 71	
St. Joseph's Institution for Improved Instruction of Deaf-Mutes at Fordham,	16,875 00	
House of Refuge, Western New York,	133,233 34	
State Reformatory, Elmira.....	44,000 00	
Society for the Reformation of Juve- nile Delinquents.....	78,333 37	
House of Refuge for Women.....	100,000 00	
State Asylum for Idiots.....	65,000 00	
Thomas Asylum for Orphan and Des- titute Indian Children.....	12,350 00	
Homoeopathic Asylum for the Insane,	13,041 74	
State Soldiers and Sailors' Home; Bath,	90,000 00	
Commissioners of Public Charities, sal- ary of secretary, office and traveling expenses.....	11,116 39	
State Commissioner in Lunacy, salary and expenses.....	6,356 67	
		1,019,788 70
Improvement of Cayuga inlet.....	6,979 68	
Commissioners of fisheries.....	11,717 14	
Interest on money in the treasury belonging to the specific funds.....	50,000 00	
State paupers, etc.....	47,710 94	
Normal school at Albany.....	1,463 85	
Normal school at Brockport.....	5,551 03	
Normal school, Fredonia.....	3,524 07	
For supplying Deaf-Mutes' Journal to deaf and dumb persons of the State.....	975 00	
For services and expenses in prosecuting war claims against the United States.....	5,059 54	
Hudson River improvement.....	24,634 02	
Commissioners of emigration.....	92,490 32	
Board of Audit, stenographer, etc.....	1,246 82	
Road commissioners, for non-resident taxes returned to Comptroller's office.....	3,000 00	
Shore inspector, for salary.....	2,000 00	
Stenographers of Supreme Court in Second Judi- cial District.....	4,687 50	
For the Adirondack survey.....	10,000 00	
For payment of Indian annuities.....	7,361 00	
For maintenance of State agency for discharged con- victs.....	7,500 00	
Carried forward.....		\$4,446,202 61

Brought forward.....	\$4,446,202 61
Boundary line, New York, Pennsylvania and New Jersey.....	2,000 00
Contagious diseases among cattle, prevention of.....	49,419 51
State survey.....	15,367 00
Mrs. J. G. Wasson, interest on New Capitol certificate for lands purchased.....	600 00
For aiding the erection of monument at Schuylerville, State Board of Health.....	3,626 19
For establishing agricultural experiment station....	30,028 66
For serving notices on occupants of public lands, ascertaining value of such lands, etc.....	38,402 19
Electors of President and Vice-President.....	2,554 95
Game and fish protectors, compensation and expenses, For the improvement of Salmon river, etc.....	929 35
For the Seamen's Retreat Hospital.....	6,156 48
Mrs. C. O. Abbott, for amount due and allowance to her husband, late clerk of committee on cities, of the Senate.....	8,000 00
For increasing the water supply of the middle division of the Erie canal, etc.....	3,948 44
For the construction of reservoirs on the Independence and Beaver rivers, Lewis county, etc.....	402 00
For building a bridge at Hume, Allegany county.....	2,500 00
For the erection of a military storehouse in the city of Binghamton.....	6,000 00
For the expenses of the commission appointed by chapter 610, Laws of 1881.....	7,000 00
For expenses of the tax sale.....	15,000 00
For compensation and expenses of the commissioners on taxation.....	5,000 00
For the expenses of the commission appointed to compile and revise the banking laws, etc.....	2,075 40
C. A. Hull, award by Board of Audit.....	1,830 25
For support of Indian schools, balance.....	3,463 00
For the removal of intruders from Indian lands.....	53 24
For the preparation and publication of a catalogue of the Law Department of the State Library.....	268 48
For the removal of causes of malaria, chapter, 593, Laws of 1881.....	150 00
For the erection of a monument to General Herkimer and his associates.....	2,475 00
For the removal of a public nuisance in the town of Munroe, Orleans county.....	3,759 99
Miscellaneous.....	3,000 00
	1,000 00
	286 34
	<hr/>
	\$4,659,499 08
Estimated revenue.....	\$4,197,694 13
Add apparent surplus, September 30, 1881.....	1,764,664 79
	<hr/>
	5,962,358 92
	<hr/>
Estimated surplus, September 30, 1882.....	\$1,302,859 84

(IV.)

SCHEDULE showing the amount of the two and four hundred and fifteen thousandths mills tax levied in 1880 on the real and personal property in each county in the State, viz.: For general purposes, one and four hundred and seventy-five thousandths mills, and to provide for a deficiency in the Canal Sinking Fund 34-100 of a mill. For New Capitol 6-10 mills, with the expenses of collection and the amount payable into the treasury; also the amount of unpaid taxes returned to the Comptroller's office and admitted.

COUNTIES.	Amount of tax.	Fees of county treasurers and counties.	Net proceeds.	Taxes returned and admit'd.
Albany.....	\$165,249 34	\$1,650 46	\$163,598 88	\$202 92
Allegany.....	27,044 29	267 00	26,777 29	488 32
Broome.....	31,917 25	319 17	31,598 08	9 61
Cattaraugus.....	31,335 40	313 35	31,022 05	.....
Cayuga.....	58,912 14	500 00	58,412 14	504 57
Chautauqua.....	51,105 62	500 00	50,605 62	.....
Chemung.....	32,121 73	321 22	31,800 51	.....
Chemung.....	37,377 39	375 77	37,001 62	131 67
Chenango.....	20,199 07	141 85	20,057 22	6,013 73
Clinton.....	68,100 13	500 00	65,600 13	.....
Columbia.....	21,237 77	210 39	21,027 38	198 53
Cortland.....	27,012 72	258 51	26,754 21	1,161 96
Delaware.....	99,019 65	500 00	98,519 65	.....
Dutchess.....	197,003 34	1,969 86	195,034 05	17 61
Erie.....	31,149 62	121 03	31,028 59	9,046 79
Essex.....	15,938 30	75 70	15,862 60	3,423 76
Franklin.....	12,868 32	128 69	12,740 13	878 70
Fulton.....	42,069 42	420 64	41,648 78	5 61
Genesee.....	21,835 40	210 47	21,624 93	788 38
Greene.....	1,897 94	.....	1,897 24	16,249 98
Hamilton.....	36,726 41	317 67	36,408 74	3,959 04
Herkimer.....	52,097 66	500 00	51,597 66	452 64
Jefferson.....	608,577 92	2,000 00	606,577 92	17,198 88
Kings.....	18,552 41	158 63	18,393 78	2,739 43
Lewis.....	43,028 74	430 29	42,598 45	.....
Livingston.....	38,172 18	380 36	37,791 77	136 43
Madison.....	124,912 96	500 00	124,412 96	.....
Monroe.....	36,043 66	360 44	35,683 22	.....
Montgomery.....	2,944,723 53	5,000 00	2,939,723 53	.....
New York.....	48,246 80	482 47	47,764 33	2,135 91
Niagara.....	104,511 44	500 00	104,011 44	.....
Oneida.....	115,961 52	500 00	115,461 52	.....
Onondaga.....	55,231 46	500 00	54,731 46	.....
Ontario.....	87,719 97	500 00	87,219 97	341 22
Orange.....	31,580 39	315 20	31,265 19	.....
Orleans.....	48,770 96	487 71	48,283 15	.....
Oswego.....	41,335 50	413 36	40,922 14	.....
Otsego.....	16,429 01	164 29	16,264 72	.....
Putnam.....	92,354 63	500 00	91,854 63	.....
Queens.....	100,122 81	500 00	99,622 81	.....
Rensselaer.....	24,268 23	149 21	24,118 02	9,341 50
Richmond.....	26,679 40	266 80	26,412 60	4,720 35
Rockland.....	44,469 88	443 90	44,025 98	290 22
Saratoga.....	20,963 05	209 63	20,753 42	.....
Schenectady.....	19,849 61	198 50	19,651 11	.....
Schoharie.....	14,010 83	140 10	13,870 73	70 93
Schuyler.....	29,720 10	297 20	29,422 90	.....
Seneca.....	49,348 89	449 01	48,899 88	4,448 37
St. Lawrence.....	43,079 26	430 27	42,649 09	52 32
Steuben.....	35,134 04	351 34	34,782 70	.....
Suffolk.....	10,877 78	108 78	10,769 00	.....
Sullivan.....	22,761 80	227 62	22,534 18	480 63
Tioga.....	28,120 02	281 19	27,838 83	97 58
Tompkins.....	43,806 62	438 07	43,368 55	.....
Ulster.....	11,239 07	81 55	11,157 52	3,083 76
Warren.....	47,692 66	476 62	47,216 04	30 10
Washington.....	49,869 81	498 70	49,371 11	.....
Wayne.....	161,396 31	1,613 26	159,783 05	.....
Westchester.....	25,442 96	254 18	25,188 78	24 36
Wyoming.....	36,044 42	260 44	35,783 98	.....
Yates.....	.....	.....	.....	.....
Add 1 85-1000 mills school tax.....	\$3,370,454 21	\$30,471 50	\$3,339,982 71	\$94,203 85
	2,822,088 12			
	\$6,232,542 33			

(V.)

CLERKS IN THE PUBLIC OFFICES.

Statement showing the amount paid for clerk hire in the public offices (except Canal, Bank and Insurance Departments) during the year ending September 30, 1881.

Governor's Office.

Present clerks :

	Amount paid.	Present salary.
E. Miggael.....	\$2,168 68	\$2,000 00
W. C. Humphrey.....	1,625 00	1,500 00
T. Newcomb	1,625 00	1,500 00
S. A. Law	1,679 50	1,500 00
S. A. Smith, military messenger.....	1,300 00	1,200 00
T. H. Brown, messenger.....	1,300 00	1,200 00
Extra clerical services	985 00	
	<hr/>	
	\$10,681 18	

Office of Secretary of State.

Present clerks :

L. Chamberlain.....	\$2,708 34	2,500 00
T. H. Ferris.....	1,950 00	1,800 00
A. D. W. Stickland	1,950 00	1,800 00
W. G. Carr.....	1,950 00	1,800 00
D. J. Blauvelt	1,625 00	1,500 00
W. H. Stevens	1,625 00	1,500 00
W. E. Kisselburgh	1,625 00	1,500 00
D. Caswell	1,625 00	1,500 00
H. A. Cozzens.....	1,625 00	1,500 00
R. A. Wood	759 14	1,500 00
W. C. Saxton.....	1,233 34	1,200 00
B. Fernow	1,083 34	1,000 00
G. H. Overocker, messenger.....	1,083 34	1,000 00
Late clerk :		
F. J. P. Chitty.....	250 00	

\$21,092 50

NOTE. — The salaries due for the month of September have, heretofore, been paid on the 1st of October. That rule was departed from this year, and the salaries were paid September 30, within the fiscal year during which the services were rendered, hence the apparent overpayments.

Comptroller's Office.

Present clerks:

	Amount paid.	Present salary.
S. W. Park.....	\$2,600 00	\$2,400 00
G. Seeley.....	2,383 34	2,200 00
W. E. Merriman.....	2,166 68	2,000 00
L. G. Benedict.....	2,125 00	2,000 00
T. H. Schuyler.....	1,625 00	1,500 00
W. H. Sanger.....	1,500 00	1,500 00
M. B. Williams.....	1,462 50	1,350 00
G. W. Bliss, Jr.....	1,462 50	1,350 00
W. H. Van Allen.....	1,462 50	1,350 00
A. Cartwright.....	1,350 00	1,350 00
F. N. Chase.....	1,537 50	1,350 00
A. T. Martyn.....	1,250 00	1,350 00
G. W. Cocks.....	315 72	1,350 00
J. T. Parker.....	1,300 00	1,200 00
J. B. Davis.....	670 00	1,200 00
T. Farlin.....	566 66	1,200 00
H. Prentiss.....	500 00	1,200 00
C. T. Pease.....	116 66	1,200 00
F. B. Holdridge.....	833 34	800 00
Messenger.....	436 57	400 00

Late clerks:

T. H. Davis.....	1,237 50
E. L. Pond.....	250 00
W. H. Doty.....	699 27
Extra clerical service.....	553 34

\$28,404 08

Treasurer's Office.

Present clerks:

R. G. Milks.....	\$3,250 00	3,000 00
L. B. Hoyt.....	1,755 55	2,000 00
W. H. Hickey.....	339 45	1,300 00
A. K. Pruyn.....	1,135 57	1,200 00
Messenger.....	400 00	400 00

Late clerk:

T. Mosher.....	1,627 78
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\$8,508 35

Office of Attorney-General.

J. C. Winslow.....	\$2,166 68	2,000 00
W. E. Yeager.....	2,166 68	2,000 00

	Amount paid.	Present salary.
W. E. Davis, stenographer	\$2,166 68	\$2,000 00
J. Manley, Jr., messenger.....	416 68	500 00
	<hr/> \$6,916 72	

Department of Public Instruction.

Present clerks:

L. Z. Remington.....	\$1,833 34	2,200 00
G. B. Weaver.....	1,950 00	1,800 00
J. W. Veeder	1,755 00	1,620 00
G. H. Beattys.....	1,855 00	1,620 00
A. S. Brulley	1,755 00	1,620 00
W. Kernan, messenger.....	390 00	360 00
	<hr/> \$9,538 34	

Office of Clerk of Court of Appeals.

Present clerks:

R. M. Barber.....	\$1,625 00	1,500 00
G. Parks.....	1,625 00	1,500 00
G. E. Baker.....	750 00	1,500 00
Messenger.....	433 34	400 00

Late clerk:

F. J. Rogers.....	875 00	
	<hr/> \$5,308 34	

Office of State Engineer and Surveyor.

Present clerks:

L. W. Midlam.....	\$2,166 68	2,000 00
H. S. Miller.....	1,625 00	1,500 00
	<hr/> \$3,791 68	

(VI)

ESTIMATED APPROPRIATIONS

Required for the expenses of government, and for other purposes, in pursuance of article 7, section 8, of the Constitution, and existing laws, for the fiscal year commencing on the 1st of October, 1882.

(In all cases where the Revised Statutes are referred to, see fifth edition.)

PAYABLE FROM THE GENERAL FUND.

Executive Department, etc. :

Governor, for salary, article 4, of section 4, of Constitution	\$10,000 00
Lieutenant-Governor, for salary, article 4, section 8, of the Constitution	5,000 00
Private secretary to the Governor, for salary, chapter 643, Laws of 1873	3,500 00
Compensation of clerks, stenographer and messenger in the Executive Department, including the military secretary and messenger, for full compensation, chapter 192, Laws of 1876	12,500 00
For incidental expenses of the government, Revised Statutes, volume 1, page 509	3,000 00
For apprehension of criminals, Revised Statutes, volume 1, page 509	500 00
For apprehension of fugitives from justice, Revised Statutes, volume 1, page 509	500 00
For repairs and incidental expenses of the Governor's house	2,000 00

Court of Appeals, viz. :

Judges of the Court of Appeals, for salaries and expenses, chapter 203, Laws of 1870, and chapter 718, Laws of 1871	63,500 00
State Reporter, for salary, chapter 541, Laws of 1872 ..	5,000 00
State Reporter, for clerk hire, chapter 192, Laws of 1876	2,000 00
Clerk of the Court of Appeals, for salary, chapter 718, Laws of 1871	5,000 00
Deputy Clerk of the Court of Appeals, for salary, chapter 541, Laws of 1872	3,000 00
Clerks in the office of the Clerk of the Court of Appeals, for salaries, chapter 541, Laws of 1872	4,500 00
For messenger to Clerk of Court of Appeals, for salary, chapter 192, Laws of 1876	400 00
Carried forward	<hr/> \$120,400 00

Brought forward.....	\$120,400 00
For furniture, books, binding, blanks, printing calendar and other necessary expenses of the office of the Clerk of the Court of Appeals, chapter 645, Laws of 1869	2,500 00
For compensation of criers and attendants for the Court of Appeals, chapter 95, Laws of 1864, and chapter 238, Laws of 1871.....	6,000 00

Supreme Court, viz. :

Justices of the Supreme Court, for salaries, chapter 408, Laws of 1870, and chapter 541, Laws of 1872.	238,800 00
For the justices of the Supreme Court, in the second judicial district, not residing in the county of Kings, for additional compensation, pursuant to chapter 765 of the Laws of 1868, \$5,000; and for the stenographers appointed under said act, \$3,750. Said amounts to be paid only from moneys which shall have been or shall be paid into the treasury for taxes levied for the purposes of said act and in pursuance thereof.....	8,750 00
Expenses of general terms Supreme Court, chapter 408, Laws of 1870.	3,000 00
For the several Judicial District Libraries, chapter 400, Laws of 1880.....	6,000 00

Attorney-General's Office, viz. :

Attorney-General, for salary, chapter 145, Laws of 1875.....	5,000 00
For deputies in the office of the Attorney-General, for salaries, chapter 40, Laws of 1878.....	8,000 00
Clerks, stenographer and messenger in the office of the Attorney-General, for salaries, chapter 40, Laws of 1878, and chapter 141, Laws of 1880.....	6,500 00
For furniture, books, binding, blanks, printing, and other necessary expenses of the office of the Attorney-General, chapter 645, Laws of 1869	750 00
For costs of suits, fees of sheriffs, compensation of witnesses, and for expenses and disbursements by the Attorney-General, Revised Statutes, volume 3, page 930.....	2,000 00
For compensation and expenses of the Attorney-General, Revised Statutes, volume 1, page 487.....	500 00

Secretary of State's Office, viz. :

Secretary of State, for salary, chapter 135, Laws of 1875	5,000 00
Deputy Secretary of State and Clerk of the Commissioners of the Land Office, for salary, and for indexing the Session Laws and making marginal notes thereof, chapter 541, Laws of 1872.....	3,500 00

Carried forward..... \$416,700 00

Brought forward.....	\$416,700 00
Clerks in the Secretary of State's office, for salaries,	18,000 00
Messenger in the Secretary of State's office, for salary,	1,000 00
For furniture, books, binding, blanks, printing and other necessary expenses of the Secretary of State's office.....	2,000 00

Comptroller's Office, viz. :

Comptroller, for salary, chapter 145, Laws of 1875....	6,000 00
Deputy Comptroller, for salary, chapter 316, Laws of 1880	4,000 00
Clerks in the office of the Comptroller, for salaries...	24,000 00
Messenger in the office of the Comptroller, for salary,	400 00
For furniture, books, binding, blanks, printing and other necessary expenses of the office of the Comptroller, chapter 280, Laws of 1864.....	2,000 00

Treasurer's Office, viz. :

Treasurer, for salary, chapter 145, Laws of 1875.....	5,000 00
Deputy Treasurer, for salary, chapter 541, Laws of 1872	3,500 00
Clerks in the office of the Treasurer, for salaries, chapter 541, Laws of 1872....	7,500 00
For furniture, books, binding, blanks, printing and other necessary expenses in the office of the Treasurer, chapter 645, Laws of 1869.....	800 00

Department of Public Instruction, viz. :

Superintendent of Public Instruction, for salary, chapter 541, Laws of 1872.....	5,000 00
Deputy Superintendent of Public Instruction, for salary, chapter 128, Laws of 1877....	3,500 00
Clerks in the office of the Superintendent of Public Instruction, for salaries, chapter 373, Laws of 1875,	8,860 00
For furniture, books, binding, blanks, printing and other necessary expenses of the office of the Superintendent of Public Instruction, chapter 541, Laws of 1872.....	2,000 00
For the Department of Public Instruction, for traveling expenses which may be incurred in the visitation of common schools, normal schools, teachers' institutes, Indian schools and other institutions under the supervision of that department	500 00

State Engineer and Surveyor's Office, viz.:

For salary of the State Engineer and Surveyor, chapter 141, Laws of 1880	5,000 00
Deputy State Engineer and Surveyor, for salary, chapter 398, Laws of 1874, \$3,500; for clerk hire, to as-	

Carried forward.....	\$515,760 00
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Brought forward.....	\$515,760 00
sist in the preparation of railroad reports, \$2,500 ; and for expenses of printing and binding said re- port, \$5,000 (to be refunded by the several railroad companies).....	11,000 00
Clerks in the office of the State Engineer and Surveyor, for salaries, chapter 541, Laws of 1872.....	3,500 00
For furniture, books, binding, blanks, printing and other necessary expenses of the office of the State Engineer and Surveyor, chapter 280, Laws of 1864.	750 00

Board of Audit, viz. .

For the Board of Audit, for compensation of a stenog- rapher, \$500 ; and for incidental expenses, \$250. . .	750 00
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Banking Department, viz. :

Superintendent of the Banking Department, for salary, \$5,000, Revised Statutes, volume 2, page 590 ; clerk hire, furniture, books, binding, blanks, printing and other necessary expenses of the office of the Super- intendent of the Banking Department, \$12,000 (to be refunded to the treasury), chapter 164, Laws of 1851.....	17,000 00
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Insurance Department, viz. :

Superintendent of the Insurance Department, for sal- ary, \$7,000, chapter 326, Laws of 1861, and 732, Laws of 1868 ; for Deputy Superintendent, for sal- ary, \$4,500, chapter 185, Laws of 1881 ; clerk hire, furniture, books, binding, blanks, printing and other necessary expenses of the Insurance Department, \$58,500 (to be refunded to the treasury), chapter 366, Laws of 1859.....	70,000 00
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State Assessors, viz. :

For compensation and traveling expenses of the State Assessors, chapter 351, Laws of 1874.....	9,000 00
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Auctioneers' Accounts, viz. :

For compensation of the agent to examine the ac- counts of auctioneers, Revised Statutes, volume 2, page 467, and chapter 547, Laws of 1866.....	1,200 00
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Weights and Measures, viz. :

Superintendent of weights and measures, for salary...	500 00
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Commissioners of Quarantine, viz. :

For salary to each of them, \$2,500.....	7,500 00
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Carried forward.....	\$636,960 00
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Brought forward.....	\$636,960 00
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Land Office, viz. :

For assessment and other expenses of public lands, and for the compensation and mileage of the Speaker of the Assembly, for attendance as Commis- sioner of the Land Office.....	1,000 00
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Public Offices, viz. :

For postage on official letters, documents, etc., of the Governor, Secretary of State, Comptroller, Treas- urer, Superintendent of Public Instruction, Attor- ney-General, State Engineer and Surveyor, Adjutant- General, Inspector-General and Clerk of the Court of Appeals.....	5,000 00
For stationery for the public offices, Revised Statutes, volume 1, page 480.....	4,000 00

State Hall, viz. :

For repairs, cleaning, labor, gas, and other necessary expenses of the State Hall.....	8,000 00
Superintendent of the State Hall, for salary, chapter 643, Laws of 1873.....	1,200 00

Regents of University, viz. :

Secretary of the Regents, for salary, chapter 541, Laws of 1872.....	2,500 00
Assistant Secretary, for salary, chapter 541, Laws of 1872	2,000 00
For compensation of botanist, chapter 541, Laws of 1872	1,500 00
For expense of postage, printing, stationery and com- pensation of messenger.....	4,000 00

State Library, viz. :

For purchase of books	4,000 00
For binding, lettering and marking books	1,500 00
For repairs, cleaning, gas, transportation of books, and other necessary expenses of the State Library.....	2,000 00
For the salaries of the librarians and assistants and janitor of the State Library, chapter 514, Laws of 1872	7,800 00

Carried forward.....	\$681,460 00
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Brought forward.....	\$681,460 00
<i>Hall for the State Cabinet of Natural History and the Agricultural Museum, viz. :</i>	
For the State Cabinet of Natural History, chapter 557, Laws of 1870.....	10,000 00
For repairs, cleaning, labor, gas, fuel and other necessary expenses, including the keeper's compensation of the Hall for the State Cabinet of Natural History,	5,000 00
<i>Fuel, viz. :</i>	
For fuel for the Capitol, the State Hall and the State Library.....	4,000 00
<i>Agriculture, viz. :</i>	
For donations to the societies in the several counties of this State, and the State Society, for the Promotion of Agriculture	28,000 00
<i>Legislature, viz. :</i>	
For compensation and mileage of members and officers of the Legislature.....	340,000 00
For advances to the Clerks of the Senate and Assembly, for contingent expenses:.....	15,000 00
For postage, expenses of committees, compensation of witnesses, Legislative Manual, Crosswell's Manual, Clerk's Manual, and other contingent expenses of the Legislature.....	18,000 00
<i>State Printing, viz. :</i>	
For the legislative printing for the State, including binding, mapping, engraving, publication of the official canvass and other official notices, chapter 24, Laws of 1846, and chapter 254, Laws of 1847.....	60,000 00
<i>State Prisons, etc., viz. :</i>	
For the support and maintenance of the several State prisons and for material and expenses of manufacturing, chapter 240, Laws of 1854, chapter 43, Laws of 1865, and chapter 458, Laws of 1866, and for ordinary repairs of the prisons.....	475,000 00
For the Superintendent of State Prisons, for salary, \$6,000; for necessary traveling expenses, \$1,000; and for necessary clerk hire and messenger, \$1,400; and for pay of janitor, fuel, postage, stationery, and other incidental expenses, \$500; chapter 24, Laws of 1877.....	8,900 00
For compensation of sheriffs, for the transportation of convicts to the prisons, asylum for insane convicts, houses of refuge and penitentiaries, chapter 123, Laws of 1849, and chapter 158, Laws of 1856; and chapter 666, Laws of 1871.....	15,000 00
Carried forward.....	\$1,660,360 00

Brought forward.....	\$1,660,360 00
For the maintenance of convicts sentenced to penitentiaries, in pursuance of chapter 158, Laws of 1856, chapter 584, Laws of 1865, chapter 667, Laws of 1866, chapter 574, Laws of 1869, chapter 247, Laws of 1874, and chapter 571, Laws of 1875.....	15,000 00
For refunding to prison contractors deposits, in pursuance of chapter 465, Laws of 1863.....	500 00

Discharged Convicts.

For the maintenance of the State agency for discharged convicts, pursuant to chapter 424, Laws of 1877, \$5,000; and for the State Agent for salary, \$2,500..	7,500 00
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Asylum for Insane Criminals, viz.:

For support and maintenance, including ordinary repairs of the Asylum for Insane Criminals, chapter 130, Laws of 1858.....	30,000 00
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State Lunatic Asylum, viz.:

For salaries of the officers of the State Asylum for Lunatics, chapter 135, Laws of 1842, chapter 595, Laws of 1867, and chapter 587, Laws of 1873.....	15,000 00
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Indian Affairs, viz.:

For payment of the annuities to the several Indian tribes, viz.:

Onondagas.....	\$2,430 00
Cayugas.....	2,300 00
Senecas.....	500 00
St. Regis.....	2,131 67
	<hr/>
	7,361 67

For relief of the Onondaga Indians, chapter 206, Laws of 1858.....	300 00
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For compensation of the agent of the Onondaga Indians, chapter 228, Laws of 1843, chapter 376, Laws of 1851, and chapter 281, Laws of 1870.....	200 00
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For compensation of the agent of the Onondaga Indians, chapter 178, Laws of 1847, and chapter 635, Laws of 1869.....	65 00
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For compensation of the agent of the Onondaga Indians on the Allegany and Cattaraugus reservation, chapter 233, Laws of 1857, and chapter 73, Laws of 1858.....	150 00
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For compensation of the attorney of the St. Regis Indians, chapter 325, Laws of 1861.....	150 00
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For compensation of the attorney of the Seneca Indians, chapter 150, Laws of 1845.....	150 00
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Carried forward.....	<hr/> \$1,736,736 67
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Brought forward.....	\$1,736,736 67
For compensation of the attorney for the Tonawanda band of Seneca Indians, chapter 839, Laws of 1867, and chapter 643, Laws of 1873.....	150 00

Onondaga Salt Springs, viz.:

For salary of the Superintendent, compensation of clerks and other persons employed, and other necessary expenses of the Onondaga Salt Springs, chapter 346, section 36, Laws of 1859.....	60,000 00
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Militia of the State, viz.:

For expenses of the National Guard of the State of New York, in pursuance of chapter 447, Laws of 1862.....	300,000 00
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Roads, etc.

For payments to commissioners of moneys received into the treasury for taxes on lands of non-residents, appropriated to the construction of roads.....	3,000 00
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County Treasurers, viz.:

For advances to county treasurers on account of taxes on property of non-residents, which may be returned to the Comptroller's office.....	60,000 00
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Transportation, viz.:

For expenses of transportation of the Session Laws, journals and documents of the Legislature, reports, books, etc., and packages by express for the public offices, and for expenses of boxes, chapter 254, Laws of 1847.....	5,000 00
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Repayment of Moneys, viz.:

For repayment of moneys to purchasers for redemption of land sold for taxes.....	30,000 00
For repayment of money erroneously paid into the treasury for taxes.....	5,000 00
For repayment of money in cases of failure of titles to lands sold by the State, Revised Statutes, volume 1, page 541.....	300 00
For repayment of money paid into the treasury through mistake, Revised Statutes, page 479.....	500 00

Miscellaneous, viz.:

For supplying other States with reports of the Court

Carried forward.....	\$2,200,686 67
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Brought forward	\$2,200,686 67
of Appeals, and of the Supreme Court, chapter 536, Laws of 1836.....	500 00
For the prosecution of the State survey, chapter 216, Laws of 1878.....	13,000 00
For the prosecution of the Adirondack survey, chap- ter 370, Laws of 1878	10,000 00

Soldiers and Sailors' Home.

For the State Soldiers and Sailors' Home, and for transportation of applicants, and for ordinary repairs,	70,000 00
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State Board of Health.

For the State Board of Health, for the maintenance of its work as authorized by chapter 322 of the Laws of 1880.....	20,000 00
For expenses of the board of pilot commissioners, New York.....	4,500 00
For the Inspector of gas-meters, for salary and contin- gent expenses, chapter 116, Laws of 1860.....	2,500 00
For the shore inspector, for salary, chapter 604, Laws of 1875, and chapter 463, Laws of 1880.....	3,500 00
To the trustees of Washington's head-quarters, for compensation of superintendent, and for care, main- tenance, repairs and improvement of grounds.....	1,000 00
For the compensation and expenses of the game and fish protectors, chapter 591, Laws of 1880.....	6,000 00

Deaf and Dumb, viz. :

For support and instruction of 300 pupils at the In- stitution for Deaf and Dumb, New York, chapter 97, Laws of 1852, or a proportionate amount for a shorter period of time than one year, or for a smaller number of pupils, as shall be duly verified by affi- davits of the president and secretary of the institu- tion.....	67,500 00
For the support and instruction of 80 pupils at the Institution for the Improved Instruction of Deaf- Mutes in New York, pursuant to chapter 180, Laws of 1870, or a proportionate amount for a shorter period of time than one year, or for a smaller num- ber of pupils, as shall be duly verified by affidavits of the president and secretary of the institution....	18,000 00
For the support and instruction of 80 pupils at the Le Contreux St. Mary's Institution for the Improved Instruction of Deaf-Mutes, at Buffalo, pursuant to the provisions of chapter 670, Laws of 1872, and sections 9 and 10 of title 1, chapter 555, Laws of 1864, or a proportionate amount for a shorter period	

Carried forward.....\$2,419,186 67

Brought forward.....	\$2,419,186 67
of time than one year, or for a smaller number of pupils, to be paid by the Comptroller, upon the certificate and oath of the president and secretary of the said institution.....	18,000 00
For the support and instruction of 115 pupils at the Central New York Institution for Deaf-Mutes, Rome, N. Y.....	25,875 00
For the support and instruction of 60 pupils, at the St. Joseph's Institution for the Improved Instruction of Deaf-Mutes, at Fordham.....	13,800 00
For the support and instruction of 75 pupils at the Western New York Institution for Deaf-Mutes, at Rochester.....	16,875 00
<i>Thomas Asylum for Orphan and Destitute Indian Children, viz.:</i>	
For the Thomas Asylum for Orphan and Destitute Indian Children, for the education and maintenance of 100 children, in pursuance of chapter 162, Laws of 1875, at the rate of eighty-five dollars <i>per capita</i> ,	8,500 00
<i>Blind, viz.:</i>	
For the support and instruction of 200 pupils at the Institution for the Blind, in New York, or a proportionate amount for a shorter period of time than one year, or for a smaller number of pupils, as shall be duly verified by affidavits of the president and secretary of the institution.....	45,000 00
For maintenance of inmates of the Institution for the Blind, and for ordinary repairs, Batavia.....	30,000 00
<i>Juvenile Delinquents, viz.:</i>	
For the Society for the Reformation of Juvenile Delinquents, in the city of New York.....	70,000 00
<i>House of Refuge, viz.:</i>	
For the House of Refuge, Western New York.....	70,000 00
<i>Idiot Asylum, viz.:</i>	
For the State Asylum for Idiots, Syracuse, for maintenance and ordinary repairs.....	45,000 00
<i>Custodial Asylum.</i>	
For the support and maintenance of the Custodial Asylum, and for ordinary repairs.....	15,000 00
<i>Willard Asylum for the Insane, viz.:</i>	
For salaries.....	11,850 00
For the support of Mark Jack, an insane Indian.....	250 00
Carried forward.....	\$2,789,036 67

Brought forward..... \$2,789,036 67

Hudson River State Hospital for the Insane, viz.:

For salaries..... 8,000 00

State Homœopathic Asylum.

For the State Homœopathic Asylum for the Insane, for salaries..... 8,000 00

Binghamton Asylum.

For the officers of the Binghamton Asylum for the Chronic Insane, for salaries..... 7,500 00

Buffalo Asylum.

For the officers of the Buffalo State Asylum for the Insane, for salaries..... 8,000 00

State Board of Charities, etc., viz.:

For the salary of the State Commissioner in Lunacy, \$4,000, and for traveling and other incidental expenses of said Commissioner, \$1,000, or so much thereof as may be necessary..... 5,000 00

For salary of secretary, \$3,500; expenses of commissioners, secretary and office contingencies, \$4,000.. 7,500 00

For support and care of paupers, per chapter 661, Laws of 1873, and chapter 549, Laws of 1880..... 40,000 00

PAYABLE FROM THE FREE SCHOOL FUND, VIZ.:

For support of the common schools of the State, or so much of the amount as shall be received from the tax of 1882..... 2,750,000 00

For the State Normal School at Albany, Buffalo, Brockport, Cortland, Fredonia, Geneseo, Oswego and Potsdam, for their maintenance, to each of them, \$18,000..... 144,000 00

For the maintenance of the Teachers' Institutes, pursuant to chapter 555, Laws of 1854..... 18,000 00

For the salaries of the commissioners of common schools..... 90,000 00

PAYABLE FROM SCHOOL FUND, VIZ.:

Capital, viz.:

For investment, in pursuance of chapter 194, Laws of 1849, \$2,000,000, or so much thereof as may be necessary..... 2,000,000 00

Carried forward..... \$7,875,036 67

Brought forward..... \$7,875,036 67

Revenues, viz.:

For dividends to common schools, Revised Statutes, volume 1, page 538.....	170,000 00
For support of Indian schools, chapter 71, Laws of 1856.....	5,000 00
For refunding money paid into the treasury for redemption of lands sold for arrears of consideration, chapter 457, Laws of 1836.....	500 00
For refunding surplus moneys received on resales of lands, Revised Statutes, volume 1, page 496.....	500 00
For expenses of lands, Revised Statutes, volume 1, page 554.....	200 00

PAYABLE FROM THE LITERATURE FUND, VIZ.:

For dividends to the academies, chapter 237, Laws of 1838.....	12,000 00
For the purchase of text-books, maps and globes, philosophical and chemical apparatus for the academies, Revised Statutes, volume 2, page 72.....	3,000 00

PAYABLE FROM THE U. S. DEPOSIT FUND, VIZ.:

Capital.

For investment, in pursuance of chapter 150, Laws of 1837 (\$500,000) or so much thereof as may be necessary.....	500,000 00
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Revenues.

For dividends to common schools, chapter 237, Laws of 1838, chapter 179, Laws of 1856.....	75,000 00
For dividends to academies, chapter 237, Laws of 1838,	28,000 00
For amount to be added to the capital of the school fund (article 9 of the Constitution)	25,000 00
For instruction of common school teachers in the academies and union schools designated by the Regents of the University, chapter 425, Laws of 1877,	30,000 00
For establishing and conducting examinations, in accordance with chapter 425, Laws of 1877.....	5,000 00
For refunding money erroneously paid into the treasury, Revised Statutes, volume 1, page 479	1,000 00

PAYABLE FROM THE COLLEGE LAND SCRIP FUND.

Revenue.

For the Cornell University, pursuant to chapter 585, Laws of 1865.....	25,000 00
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Carried forward..... \$8,755,236 67

Brought forward..... \$8,755,236 67

PAYABLE FROM THE MILITARY RECORD FUND.

Revenue.

For expenses of the Bureau of Military Statistics 1,700 00

PAYABLE FROM THE ELMIRA FEMALE COLLEGE EDUCATIONAL FUND.

Revenue.

For the Elmira Female College, chapter 643, Laws of 1867..... 3,500 00

\$7,760,436 67

(VII.)

SCHEDULE of Duties Paid by the Several Auctioneers in the State during the Year ending September 30, 1881.

Albany	J. S. Dickerman.....	\$11 00
	C. G. Calo.....	2 25
Binghamton..	Daniel Lyons.....	7 31
Brooklyn	Arthur Winnington	2 44
Buffalo	Robert McCann.....	8 06
	Mary & Doll.....	1 33
Fort Plain ...	Chester J. Manzer ...	36
New York ...	Frederick G. Wolbert.....	11,515 83
	J. C. Wilmerding	11,003 97
	E. E. Hoyt.....	1,641 47
	James Williams.....	1,753 15
	William Topping	946 97
	Geo. A. Leavitt	910 90
	R. M. Montgomery.....	681 83
	Edward Schenck.....	492 72
	Thos. E. Kirby.....	477 67
	R. R. Haydock.....	358 11
	J. H. Draper	352 68
	John H. Austin.....	309 14
	G. J. Banks.....	279 03
	Eugene Bissell.....	256 38
	D. A. Matthews.....	155 22
	Henry B. Hertz.....	137 70
	Hewlett Scudder.....	127 65
	James P. Silo	76 83
	Andrew Merwin	67 12
	E. M. Brown.....	46 27
	J. Wiseman	41 06
	Edward L. Lewis	33 88

Carried forward..... \$31,698 33

ANNUAL REPORT OF THE COMPTROLLER.

67

Brought forward.....		\$31,698 33
New York ...	William Shannon.....	25 90
	Simon Herman	27 77
	D. Clarkson	22 82
	* Francis Colton	20 72
	Daniel H. Burdett	20 55
	Wm. Cole.....	18 99
	James M. Watt.....	11 99
	Richard Field	5 49
	James Cagney.....	2 62
	L. M. Hayes.....	1 84
	Martin B. Boice.....	2 25
	C. F. Walters	1 22
	Isaac Solomon.....	1 07
	Edward Pettinger.....	91
	Chas. T. Leviness ..	75
	Wm. Abbott	57
	John W. Campbell.....	37
	I. T. Winneberger.....	38
Oswego	Hiram Allen	1 99
Owego.....	Geo. F. Cameron.....	14 72
Poughkeepsie.	James B. Sisson	1 00
Rochester ...	Chas. H. Yost.....	15 24
Schenectady ..	Jesse O. Abbott.....	2 81
Syracuse	Holmes Candee.....	69
Total.....		<u>\$31,900 99</u>

(VIII.)

OFFICE OF THE SUPERINTENDENT OF THE
ONONDAGA SALT SPRINGS,
SYRACUSE, October 8, 1881. }

To the Hon. JAMES W. WADSWORTH, Comptroller of the State of New York :

SIR — The thirteenth section of chapter 346 of the Laws of 1859, provides that the Superintendent shall, at the expiration of each fiscal year ending on the 30th day of September, or within ten days thereafter, make a report to the Comptroller stating the quantity of salt inspected during the previous year, the amount of revenues accruing thereon, and from other sources, the expenditures and the amount which, in his judgment, will be necessary for the support of the salt springs for the ensuing year.

In obedience to this provision of the law, I have to report that the quantity of salt inspected the last fiscal year was (7,653,394) seven millions six hundred and thirty-three thousand three hundred and ninety-four bushels.

The revenue accruing thereon was.....	\$76,334 47
The revenue from rents, penalties and sales.....	130 00
	<hr/>
	\$76,464 47
The expenditures for the fiscal year ending September 30, 1881, were.....	59,470 24
	<hr/>
Leaving a surplus revenue of.....	<u>\$16,994 23</u>

The amount drawn from the treasury by the Superintendent during the fiscal year was \$60,864.41.

In addition to this amount, there was in the hands of the Superintendent at the beginning of last fiscal year the sum of \$7,239.06 remaining from moneys unexpended and drawn from the treasury; and there is now unexpended and in the hands of the Superintendent the sum of \$8,633.23, applicable to the payment of expenses for the fiscal year just commenced.

The books in the Comptroller's office show only the expenditures up to the month of September—the vouchers for expenditures for that month, which amount to \$3,974.86, will not be sent to that office until the first day of November, when the regular settlement for the two months, September and October, will be made as provided by law.

The following is an estimate in detail of the amount of money which it will be necessary to expend for the support of the salt springs for the fiscal year commencing October 1, 1882.

Estimate.

For salaries of officers.....	\$23,000 00
For new aqueducts.....	1,000 00
For repairs of old aqueducts.....	2,000 00
For new machinery and repairs of old.....	6,000 00
For labor and teaming.....	8,000 00
For coal for steam engines.....	10,000 00
For services of engineers of steam engines.....	3,500 00
For new wells and cleaning old.....	3,000 00
For merchandise and oil.....	2,000 00
For miscellaneous.....	1,500 00
	<hr/>
	<u>\$60,000 00</u>

The items of the foregoing estimate of \$60,000 are as nearly divided among the various objects of expenditure as is practicable, at this distance of time.

Very respectfully submitted by your obedient servant,

N. STANTON GERE,

Sup't. Onondaga Salt Springs.

(IX.)

COST OF STATIONERY

Delivered to the public offices, etc., during the fiscal year ending September 30, 1881.

Adjutant-General	\$162 67
Attorney-General	197 16
Adirondack survey, Superintendent of	26 03
Bank Department.....	49 92
Comptroller	272 27
Clerk of Court of Appeals.....	333 40
Commissioners Public Charities.....	80 64
Committee to investigate management of the canals.....	3 06
Canal Department, Auditor.....	25 97
Department of Public Instruction.....	132 16
Executive Department.....	373 96
Geological rooms.....	6 91
Inspector-General.....	42 18
Insurance Department.....	218 02
Public Works, Department of.....	47 09
State Engineer and Surveyor.....	165 69
State Board of Health.....	176 36
State Board of Health (Bureau of Analysis).....	50 18
Secretary of State.....	580 02
Superintendent State Prisons.....	9 51
Tax Commissioners.....	25 82
Treasurer's office.....	93 62
	<hr/>
	\$3,072 64

The following amounts have been refunded to the treasury during the past year for stationery furnished to certain State departments, and for cash sales :

Bank Department.....	\$49 92
Canal Department (Auditor).....	25 97
Department of Public Works.....	46 19
Commissioners to Revise Military Code.....	20 72
Insurance Department.....	218 02
State Board of Health.....	329 64
State Board of Health (Bureau of Analysis).....	50 18
Sundry cash sales.....	15 42
	<hr/>
	\$756 06

(X.)

SCHEDULE showing the amount of town, county, school and State taxes, and the rate of taxation on each dollar of the aggregate valuations for the year 1881, as fixed by the Board of Equalization, from the returns to the Comptroller's office for 1880, and the aggregate of said equalized valuations of real and personal property in the several counties of this State. (For valuations of 1881, returned to the Comptroller's office, see Schedule XI.)

COUNTIES.	Aggregate equalized valuation.	Town taxes.	County taxes.	1 14-100 mills school tax.	1 11-100 mills State tax.	Aggregate taxation.	Rate of tax on \$100 val.
Albany.....	\$67,372,736	\$893,055 18	\$446,147 12	\$76,804 92	\$74,788 74	\$1,490,790 96	2.212
Allegany.....	11,183,196	37,380 89	45,479 14	12,748 84	12,413 35	108,032 22	0.965
Broome.....	13,405,482	54,606 02	50,129 06	15,282 24	14,880 09	184,897 41	1.006
Cattaraugus.....	13,461,422	55,654 91	40,839 58	15,346 02	14,942 18	126,782 69	0.942
Cayuga.....	24,638,183	154,618 23	56,489 09	28,087 53	27,348 38	266,543 23	1.082
Chautauqua.....	21,052,106	98,457 62	67,104 11	28,999 40	28,867 84	207,928 97	0.988
Chemung.....	18,548,632	50,709 42	63,515 58	15,445 44	15,038 98	144,709 42	1.068
Chenango.....	15,357,414	176,534 47	41,610 11	17,507 45	17,046 73	252,698 76	1.644
Clinton.....	8,276,332	62,031 28	50,416 68	9,435 02	9,186 73	181,069 71	1.583
Columbia.....	26,611,838	65,630 28	119,509 35	30,837 49	29,539 13	245,016 25	0.809
Cortland.....	8,830,413	51,107 01	89,320 04	10,066 67	9,801 76	110,295 48	1.249
Delaware.....	11,225,599	126,871 22	80,662 50	12,797 19	12,460 41	182,291 82	1.624
Dutchess.....	41,300,553	103,562 19	128,677 80	47,082 63	45,843 61	325,166 33	0.787
Erie*.....	82,904,716	42,654 27	427,247 83	94,511 88	92,024 23	666,437 71	0.804
Essex.....	8,744,328	57,499 63	32,134 92	9,968 54	9,706 20	99,309 29	1.135
Franklin.....	6,677,571	15,201 84	38,384 27	7,612 43	7,412 10	63,610 64	0.952
Fulton.....	5,569,077	30,893 54	50,327 06	6,348 74	6,181 68	98,651 02	1.681
Genesee.....	17,559,775	39,425 82	28,933 80	20,018 14	19,491 85	107,868 11	0.614
Greene.....	9,187,526	22,666 37	87,986 10	10,473 78	10,198 15	131,324 40	1.429

ANNUAL REPORT OF THE COMPTROLLER.

71

	703,856	8,535 88	9,213 83	905 00	881 14	19,535 88	2,450
Hamilton.....	14,742,008	51,555 56	43,563 98	16,805 80	16,368 63	128,288 06	0.870
Herkimer.....	21,170,467	128,767 28	126,931 16	24,184 38	23,426 23	303,831 99	1.432
Jefferson*.....	256,249,210	4,438,110 52	1,174,116 66	300,984 10	283,326 62	6,186,537 90	2.423
Kings.....	7,688,301	32,003 49	26,584 25	8,764 67	8,584 01	75,946 42	0.988
Lewis.....	18,055,847	60,025 10	48,499 92	20,583 09	20,041 44	149,149 55	0.826
Livingston.....	16,024,150	79,135 52	47,059 41	18,267 53	17,780 52	162,849 27	1.016
Madison.....	56,661,734	87,919 80	238,182 00	64,594 88	62,894 51	446,580 70	0.792
Monroe.....	15,641,589	52,542 32	49,649 77	17,831 43	17,362 16	137,385 67	0.835
Montgomery.....	1,955,382,809	+	27,029,711 27	1,481,136 40	1,398,474 92	29,854,322 59	2.378
New York.....	20,162,476	86,802 43	76,494 37	22,985 22	22,380 35	208,662 37	1.985
Niagara.....	43,478,800	113,698 64	171,541 72	49,560 18	48,255 92	383,056 41	0.881
Oneida.....	47,958,872	177,738 48	182,324 72	54,673 11	53,234 35	467,965 66	0.975
Onondaga.....	28,014,008	52,389 64	74,397 85	26,285 97	25,545 54	178,569 00	0.775
Ontario.....	35,801,950	128,739 57	155,045 85	40,814 23	39,740 16	364,339 81	1.017
Orange.....	13,124,410	55,092 80	44,392 81	14,961 82	14,568 10	129,015 53	0.983
Orleans.....	19,545,899	239,654 67	110,000 00	22,282 32	21,695 95	393,632 94	2.014
Oswego.....	17,281,684	82,409 91	54,304 47	19,701 12	19,182 67	175,498 17	1.015
Otsego.....	6,913,382	13,000 49	25,029 84	7,881 26	7,673 85	58,585 44	0.775
Putnam*.....	37,268,165	144,005 19	215,052 20	42,485 71	41,967 66	442,910 76	1.188
Queens.....	41,537,344	121,566 60	201,137 01	47,352 57	46,106 45	416,162 63	1.002
Rensselaer.....	10,122,785	40,700 23	169,696 93	11,539 98	11,230 29	233,173 43	2.303
Richmond*.....	12,251,207	15,947 74	38,388 38	18,968 38	18,598 84	81,901 34	0.668
Rockland.....	18,328,502	79,236 04	79,940 99	20,894 49	20,344 64	196,116 16	1.070
Saratoga.....	8,868,491	98,255 25	33,249 10	10,110 08	9,844 03	151,458 46	1.707
Schenectady.....	8,447,543	89,345 40	43,447 50	9,630 20	9,376 77	151,799 87	1.797
Schoharie.....	5,721,554	20,157 57	24,490 28	6,522 57	6,350 93	57,521 35	1.005
Schuyler.....	12,844,910	53,708 76	23,091 81	14,073 20	13,702 85	104,576 62	0.847
Seneca.....	20,588,840	85,479 54	81,221 60	23,471 28	22,853 61	213,026 03	1.035
St. Lawrence.....	17,875,684	98,918 00	76,561 72	20,378 28	19,842 01	215,700 01	1.206
Steuben.....	14,537,819	42,043 11	49,171 57	16,573 11	16,136 98	123,924 77	0.852
Suffolk.....	4,596,171	33,770 09	37,988 50	6,239 63	6,101 75	82,084 97	1.786
Sullivan*.....	9,548,740	84,490 27	32,596 52	10,885 57	10,599 10	138,571 46	1.451
Tioga.....	11,764,007	92,628 14	27,073 66	13,410 97	13,058 05	146,170 82	1.242
Tompkins.....	17,986,884	246,631 40	220,269 56	20,504 99	19,965 39	507,371 34	2.821
Ulster.....							

(X.)

SCHEDULE showing the amount of town, county, school and State taxes, and the rate of taxation on each dollar of the aggregate valuations for the year 1881, as fixed by the Board of Equalization, from the returns to the Comptroller's office for 1880, and the aggregate of said equalized valuations of real and personal property in the several counties of this State. (For valuations of 1881, returned to the Comptroller's office, see Schedule XI.)

COUNTIES.	Aggregate equalized valuation.	Town taxes.	County taxes.	1 14-100 mills school tax.	1 11-100 mills State tax.	Aggregate taxation.	Rate of tax on \$100 val.
Albany.....	\$67,372,736	\$893,055 18	\$446,147 12	\$76,804 92	\$74,788 74	\$1,490,790 96	2.212
Allegany.....	11,183,196	37,380 89	45,479 14	12,748 84	12,413 35	108,022 22	0.965
Broome.....	18,405,482	54,606 02	50,129 06	15,282 24	14,880 09	184,897 41	1.006
Cattaraugus.....	13,461,422	55,654 91	40,889 58	15,846 02	14,942 18	126,782 69	0.942
Cayuga.....	24,638,183	154,618 23	56,489 09	28,087 53	27,848 38	266,543 23	1.082
Chautauqua.....	21,052,106	98,457 62	67,104 11	23,999 40	23,367 84	207,928 97	0.988
Chemung.....	13,548,632	50,709 42	63,515 58	15,445 44	15,088 98	144,709 42	1.068
Chenango.....	15,357,414	176,584 47	41,610 11	17,507 45	17,046 73	252,698 76	1.844
Clinton.....	8,276,382	62,031 28	50,416 68	9,435 02	9,186 73	181,069 71	1.583
Columbia.....	26,611,838	65,680 28	119,509 35	30,837 49	29,589 13	245,016 25	0.909
Cortland.....	8,830,413	51,107 01	39,320 04	10,066 67	9,801 76	110,295 48	1.249
Delaware.....	11,225,599	126,871 22	80,682 50	12,797 19	12,460 41	182,291 32	1.624
Dutchess.....	41,300,553	103,652 19	128,877 80	47,082 63	45,843 61	325,166 23	0.787
Erie*.....	82,904,716	52,654 27	427,247 83	94,511 88	92,024 23	666,487 71	0.804
Essex.....	8,744,328	47,499 63	32,134 92	9,968 54	9,706 20	99,309 29	1.135
Franklin.....	6,677,571	15,201 84	38,384 27	7,612 43	7,412 10	63,610 64	0.952
Fulton.....	5,569,077	30,893 54	50,227 06	6,348 74	6,181 68	93,651 02	1.681
Genesee.....	17,559,775	39,425 82	28,933 80	20,018 14	19,491 35	107,868 11	0.614
Greene.....	9,187,526	22,666 87	37,986 10	10,473 78	10,198 15	131,324 40	1.429

Hamilton.....	793,856	8,525 88	9,213 82	905 00	891 18	10,525 88	2,459
Herkimer.....	14,742,008	51,555 56	43,563 89	16,805 80	16,363 03	128,298 06	0,870
Jefferson*.....	21,170,407	128,767 28	126,931 16	24,184 88	28,490 22	803,331 99	1,482
Kings.....	255,249,210	4,438,110 52	1,174,116 66	290,984 10	288,326 62	6,180,537 90	2,428
Lewis.....	7,688,301	32,063 49	26,584 25	8,764 67	8,534 01	75,046 42	0,968
Livingston.....	18,055,347	60,025 10	48,499 92	20,598 09	20,041 44	140,149 55	0,826
Madison.....	16,024,150	79,135 52	47,059 41	18,267 53	17,786 81	162,840 27	1,016
Monroe.....	56,661,734	87,919 80	283,182 00	64,594 88	62,894 52	448,590 70	0,792
Montgomery.....	15,641,589	52,542 32	49,649 77	17,831 42	17,362 16	187,385 67	0,835
New York.....	1,235,382,809	+	27,029,711 27	1,481,136 40	1,393,474 92	29,854,322 59	2,378
Niagara.....	20,162,476	86,802 43	76,494 87	22,985 22	22,380 35	208,662 87	1,985
Oneida.....	43,473,800	118,698 64	171,541 72	49,560 18	48,255 92	383,056 41	0,881
Onondaga.....	47,958,872	177,733 48	182,324 72	54,673 11	53,234 35	467,965 66	0,975
Ontario.....	33,014,008	52,389 57	74,397 85	26,235 97	25,545 54	178,569 00	0,775
Orange.....	35,801,950	128,739 54	155,045 85	40,814 23	39,740 16	364,339 81	1,017
Orleans.....	13,124,410	55,092 80	44,392 81	14,961 82	14,568 10	129,015 53	0,983
Oswego.....	19,545,899	239,654 67	110,000 00	22,282 32	21,695 95	393,632 94	2,014
Otsego.....	17,281,684	82,409 91	54,304 47	19,701 12	19,182 67	175,498 17	1,015
Putnam*.....	6,913,382	13,000 49	25,029 84	7,881 26	7,673 85	58,585 44	0,775
Queens.....	37,268,165	144,005 19	215,052 20	42,485 71	41,367 66	442,010 76	1,188
Reusselaer.....	41,537,344	121,566 60	201,137 01	47,352 57	46,106 45	416,162 63	1,002
Richmond*.....	10,122,785	40,700 23	169,096 93	11,539 98	11,230 29	238,173 43	2,803
Rockland.....	12,251,207	15,947 74	38,388 38	13,966 38	13,598 84	81,901 34	0,668
Saratoga.....	18,328,502	75,236 04	79,640 99	20,894 49	20,344 64	196,116 16	1,070
Schenectady.....	8,868,491	98,255 25	33,249 10	10,110 08	9,844 03	151,458 46	1,707
Schoharie.....	8,447,543	89,345 40	43,447 50	9,630 20	9,376 77	151,799 87	1,797
Schuyler.....	5,721,554	20,157 57	24,490 28	6,522 57	6,350 93	57,521 35	1,005
Seneca.....	12,844,910	53,708 76	23,091 81	14,073 20	13,702 85	104,576 62	0,847
St. Lawrence.....	20,588,840	85,479 54	81,221 60	23,471 28	22,853 61	213,036 03	1,035
Steuben.....	17,875,684	98,918 00	76,561 72	20,378 28	19,842 01	215,700 01	1,206
Suffolk.....	14,537,819	42,043 11	49,171 57	16,578 11	16,136 98	123,924 77	0,852
Sullivan*.....	4,596,171	33,770 09	37,988 50	5,239 63	5,101 75	82,094 97	1,786
Tioga.....	9,548,740	84,490 27	32,596 52	10,885 57	10,599 10	138,571 46	1,451
Tompkins.....	11,764,007	92,628 14	27,073 66	13,410 97	13,058 05	146,170 82	1,242
Ulster.....	17,986,834	246,631 40	220,369 56	20,504 99	19,905 39	507,371 34	2,821

(X.) — Continued.

COUNTIES.	Aggregate equalized valuation.	Town taxes.	County taxes.	1 14-100 mill school tax.	1 11-100 mills State tax.	Aggregate taxation.	Rate of tax on \$1 valuation in cents.
Warren.....	\$4,679,291	\$25,842 90	\$36,016 03	\$5,334 39	\$5,194 01	\$72,387 38	1.547
Washington.....	19,551,580	42,892 64	50,970 91	22,288 74	21,793 20	137,854 49	0.705
Wayne.....	20,878,388	108,640 39	42,126 53	23,801 35	23,175 01	192,748 28	0.923
Westchester*	67,118,957	852,456 99	212,131 42	76,509 91	74,496 49	715,594 81	1.066
Wyoming.....	10,798,604	66,689 14	22,500 00	12,310 41	11,986 45	113,486 00	1.051
Yates.....	10,854,404	35,272 85	28,864 18	12,374 02	12,048 39	83,559 44	0.769
Total	\$2,681,257,606	\$9,990,905 03	\$33,263,037 91	\$3,056,633 67	\$2,976,195 94	\$49,286,772 55	1.838

* No returns received from these counties; the town and county taxes are from returns of previous years.

† City covers the whole county, and is included in county taxes.

‡ Includes city levies.

(XI.)

SCHEDULE showing the valuation of real and personal property in the several counties of the State, as returned to the Comptroller's office, for the year 1881; also the number of acres assessed in each county.

COUNTIES.	Acres of land assessed.	Assessed value of real estate.	Assessed value of personal estate.	Corrected aggregate valuation.
Albany	305,408	\$81,452,070	\$8,899,220	\$90,342,290
Allegany	639,476	12,643,724	1,063,912	13,712,636
Broome	430,689	17,320,597	1,312,890	18,633,417
Cattaraugus	802,496	19,915,855	1,697,900	21,613,755
Cayuga	413,840	27,136,596	3,112,123	30,247,719
Chautauqua	656,638	23,678,373	2,669,289	26,347,662
Chemung	246,345	17,579,444	1,405,548	18,984,992
Chenango	547,356	16,257,309	2,463,485	18,720,794
Clinton	566,033	8,119,261	1,010,308	9,129,569
Columbia	382,656	21,699,517	4,323,680	26,023,197
Cortland	311,480	8,329,292	1,079,979	9,409,271
Delaware	870,939	11,410,311	1,539,613	12,949,924
Dutchess	483,726	38,546,091	7,172,581	45,718,672
Erie*	612,846	110,090,591	9,892,612	119,483,208
Essex	937,181	10,844,066	786,197	11,630,263
Franklin	860,990	6,805,509	1,054,919	7,860,428
Fulton	298,137	3,374,961	338,489	3,713,450
Genesee	309,804	14,248,471	2,409,780	16,658,251
Greene	874,849	4,401,960	487,243	4,889,203
Hamilton	741,236	546,689	1,000	547,689
Herkimer	775,062	11,699,941	1,396,791	13,096,732
Jefferson*	733,585	26,924,996	3,382,787	30,307,783
Kings .....	.....	251,872,664	15,137,040	267,009,704
Lewis	749,631	6,781,367	825,200	7,606,567
Livingston	382,013	21,024,940	2,467,129	23,492,069
Madison	388,361	17,401,093	2,401,340	19,802,433
Monroe	386,182	67,272,981	2,946,120	70,219,101
Montgomery	228,975	6,783,490	382,542	7,166,032
New York .....	.....	976,235,199	209,912,369	1,186,147,568
Niagara	305,756	26,780,919	1,834,916	28,615,835
Oneida	733,602	43,696,593	4,418,407	48,115,000
Onondaga	460,270	63,583,161	7,157,743	70,739,904
Ontario	392,063	30,789,344	3,842,726	34,632,070
Orange	490,432	31,408,125	5,821,171	37,229,296
Orleans	236,787	15,705,326	1,705,575	17,410,901
Oswego	580,272	24,156,519	1,165,108	25,321,627
Otsego	607,273	10,646,484	1,468,674	12,115,157
Putnam*	132,683	6,933,905	1,531,175	8,464,780
Queens	178,572	34,890,015	2,378,150	37,268,165
Rensselaer	593,118	24,328,715	3,928,566	28,257,271
Richmond*	30,368	8,020,353	448,350	9,378,003
Rockland	100,069	9,231,899	1,302,847	10,534,746
Saratoga	495,010	19,290,094	1,658,022	20,948,116
Schenectady	119,470	5,964,754	523,448	6,488,197
Schoharie	373,636	6,806,108	812,540	7,618,648
Schuyler	199,122	6,126,772	641,603	6,768,375
Seneca	198,214	13,180,909	1,654,241	14,835,150
St. Lawrence	1,617,011	23,924,755	1,823,043	25,747,798
Steuben	835,000	21,937,227	2,251,556	24,188,783
Suffolk	439,817	12,227,497	1,822,750	14,050,247
Sullivan*	604,508	5,814,868	271,581	6,086,449
Tioga	314,845	12,048,587	912,270	13,960,857
Tompkins	292,387	9,917,753	1,317,837	11,235,590
Ulster	635,272	17,814,829	2,904,972	20,719,801
Warren	496,982	2,193,837	435,795	2,629,632
Washington	497,036	15,525,287	2,600,421	18,125,708
Wayne	349,500	21,253,134	1,738,938	22,992,072
Westchester* .....	.....	54,145,092	3,189,808	57,334,900
Wyoming	370,195	12,890,337	1,369,618	14,259,955
Yates	207,204	6,051,724	755,208	6,806,932
	†27,152,232	\$2,435,588,260	\$354,769,540	\$2,790,347,800

* No returns received from these counties, therefore taken from the statements of previous year.

† Exclusive of cities.

(XII.)

SCHEDULE showing the aggregate valuations of real and personal property, the State and local taxes, and the rate per cent for each year, from 1845 to 1881, inclusive.

YEAR.	Aggregate valuation.	State taxes, exclusive of school tax.	Town, county and school tax.	Total taxes.	Rate of tax on \$1 valuation, in cents.
1845	\$605,646,095	\$361,300,62	\$2,900,318,83	\$4,170,527,95	0.688
1846	618,824,955	370,557,44	4,276,404,44	4,647,461,88	0.763
1847	632,069,893	302,570,97	4,041,046,35	4,343,617,32	0.703
1848	651,919,586	325,658,72	4,040,819,61	4,366,478,33	0.672
1849	666,890,767	334,455,96	5,214,425,32	5,548,881,28	0.838
1850	727,494,553	394,008,76	6,946,763,68	7,340,772,44	0.997
1851	1,077,851,680	578,648,68	6,180,861,88	6,759,510,56	0.627
1852	1,168,336,237	532,641,69	6,715,046,89	7,247,688,58	0.600
1853	1,266,696,190	1,020,325,49	8,090,097,03	9,110,422,52	0.727
1854	1,364,154,625	1,751,717,78	8,615,164,83	10,366,882,61	0.768
1855	1,412,849,304	1,430,000,02	9,024,454,62	10,454,454,62	0.737
1856	1,430,394,696	1,821,775,42	11,312,845,04	13,134,620,46	0.915
1857	1,438,907,713	2,457,533,80	11,941,863,94	14,399,397,74	1.007
1858	1,404,913,678	2,458,569,10	12,008,004,76	14,466,573,86	1.036
1859	1,419,297,520	4,876,167,35	13,894,887,46	18,771,144,81	1.325
1860	1,444,767,430	4,506,523,19	15,896,753,29	20,403,176,48	1.415
1861	1,449,303,948	5,797,215,79	16,905,367,69	22,702,583,48	1.564
1862	1,454,454,817	6,181,432,97	18,119,446,11	24,301,011,05	1.666
1863	1,500,869,877	6,067,816,77	18,983,293,85	25,051,110,69	1.668
1864	1,550,879,686	7,369,042,68	23,199,202,06	30,568,244,74	1.973
1865	1,531,229,636	10,567,084,06	23,962,730,31	34,529,814,37	2.256
1866	1,654,107,725	8,085,705,59	28,023,538,13	36,109,243,82	2.183
1867	1,766,089,140	11,827,225,07	38,601,459,14	50,428,684,21	2.828
1868	1,890,120,770	16,970,097,90	46,541,338,13	63,511,336,12	3.361
1869	1,947,001,185	12,138,870,40	38,305,685,37	50,444,555,77	2.644
1870	2,032,537,898	12,015,847,24	44,736,594,68	56,752,440,90	2.804
1871	2,068,637,445	11,246,955,43	44,678,515,21	56,925,080,64	2.754
1872	2,180,624,336	5,446,349,28	46,702,028,14	52,148,377,42	2.384
1873	2,188,307,873	5,628,833,16	44,610,860,91	50,247,754,06	2.314
1874	2,168,307,873	6,013,971,22	43,083,270,76	49,107,241,97	2.264
1875	2,367,750,102	4,773,269,24	42,747,527,97	47,520,287,21	2.004
1876	2,496,267,273	6,370,464,21	46,310,576,61	52,780,740,82	2.154
1877	2,766,740,313	2,970,195,94		49,750,936,76	1.804
1878	2,738,973,600			49,286,772,55	1.804
1879	2,686,186,138				
1880	2,637,899,238				
1881	2,681,237,606				

(XIII.)

SCHEDULE showing the rate of State tax on each dollar of the aggregate valuations of property, from 1816 to 1881, both inclusive.

	Mills.		Mills.
1816.....	2	1857.....	3
1817.....	2	1858.....	2 $\frac{1}{2}$
1818.....	3	1859.....	2 $\frac{1}{2}$
1819.....	1	1860.....	3 $\frac{1}{2}$
1820.....	1	1861.....	3 $\frac{1}{2}$
1821.....	1	1862.....	4 $\frac{1}{2}$
1822.....	1	1863.....	5
1823.....	1	1864.....	5 $\frac{1}{2}$
1824.....	1	1865.....	4 $\frac{3}{8}$
1825.....	$\frac{1}{2}$	1866.....	5 $\frac{1}{8}$
1826.....	$\frac{1}{2}$	1867.....	7 $\frac{3}{8}$
1827.....	1	1868.....	5 $\frac{1}{2}$
1828.....	1	1869.....	5 $\frac{1}{2}$
1829.....	1 $\frac{1}{10}$	1870.....	7 $\frac{1}{10}$
1830.....	$\frac{6}{10}$	1871.....	5 $\frac{1}{10}$
1831.....	$\frac{6}{10}$	1872.....	9 $\frac{3}{8}$
1832.....	$\frac{1}{2}$	1873.....	6 $\frac{2}{10}$
1833.....	$\frac{1}{2}$	1874.....	7 $\frac{1}{4}$
1834.....	$\frac{1}{2}$	1875.....	6
1835.....	$\frac{1}{2}$	1876.....	3 $\frac{1}{4}$
1836.....	$\frac{1}{2}$	1877.....	3 $\frac{1}{2}$
1837.....	$\frac{1}{2}$	1878.....	2 $\frac{1}{10}$
1838.....	$\frac{1}{2}$	1879.....	2 $\frac{3}{10}$
1839.....	1	1880.....	3 $\frac{1}{2}$
1840.....	$\frac{3}{4}$	1881.....	2 $\frac{1}{2}$
1841.....	1 $\frac{1}{4}$		
1842.....	1 $\frac{3}{4}$		

(XIV.)

To the Comptroller of the State of New York :

In pursuance of the requirements of chapter 481 of the Laws of 1866, I, Emmons L. Williams, acting treasurer of the Cornell University, respectfully report :

That for the year ending November 1, 1881, contracts for the sale of land, and of pine timber (land reserved), were made as follows :

For 39,864 ³ / ₁₀₀ acres of land for.....	\$554,382 00
For the pine timber on 8,874 ³ / ₁₀₀ acres for.....	66,055 00
Cash received during same period.....	163,001 34
Cash disbursed during same period.....	<u>134,512 97</u>

Respectfully submitted,

[L. S.]

EMMONS L. WILLIAMS,

Acting Treasurer.

ITHACA, N. Y., Nov. 8, 1881.

STATE OF NEW YORK, }
Tompkins County, } ss.:

Emmons L. Williams, being duly sworn, deposes and says, he is the acting treasurer of the Cornell University, that he has read the foregoing report, and carefully examined the books and accounts upon which it is founded, and that the same is correct and true to the best of his knowledge, information and belief.

[L. S.]

EMMONS L. WILLIAMS.

Sworn before me, this 8th day }
of November, 1881. }

G. VAN RENSSELAER, *Notary Public.*

(XV.)

SCHEDULE showing the amount of taxes on lands of non-residents returned for the years 1878, 1879 and 1880, with the amount thereof admitted and rejected from said returns; also the amount of said rejected taxes which have been corrected and subsequently admitted.

COUNTIES.	1878.			1879.			1880.		
	Returned.	Admitted.	Rejected.	Returned.	Admitted.	Rejected.	Returned.	Admitted.	Rejected.
Albany.....	\$ 843 29	\$ 597 31	\$ 246 98	\$ 730 99	\$ 441 63	\$ 289 31	\$ 976 06	\$ 303 92	\$ 773 14
Allegany.....	774 87	468 57	306 30	184 81	67 85	126 96	530 54	438 32	132 22
Broome.....	333 43	84 51	248 92	184 81	67 85	126 96	130 41	9 61	120 80
Cattaraugus.....	5,969 52	2,504 72	3,464 80	2,164 83	2,113 84	40 99	1,073 94	964 57	109 37
Cayuga.....	4,360 57	4,091 63	268 94	2,164 83	2,113 84	40 99	1,073 94	964 57	109 37
Chemung.....	60 10	60 10	0 00	2,164 83	2,113 84	40 99	1,073 94	964 57	109 37
Chenango.....	418 81	281 84	136 97	1,065 04	533 56	531 48	157 73	131 67	226 06
Clinton.....	10,748 24	8,794 88	1,953 36	8,304 49	5,533 85	2,770 64	9,878 23	6,013 73	3,864 50
Cortland.....	1,441 33	898 43	542 90	1,616 28	1,221 29	394 99	1,868 89	1,168 53	1,700 36
Delaware.....	4,323 14	2,423 10	1,900 04	3,417 05	1,579 18	1,837 87	1,744 91	1,161 98	1,582 93
Essex.....	1,139 19	162 79	976 40	843 10	161 85	681 25	752 46	17 61	734 85
Franklin.....	20,795 67	15,076 44	5,719 23	18,649 59	14,238 56	4,411 03	12,896 05	9,046 79	3,849 26
Fulton.....	17,508 84	16,157 42	1,351 42	16,065 48	13,769 57	2,295 91	9,435 80	8,423 76	1,012 04
Genesee.....	2,883 91	1,810 24	1,073 67	2,920 33	1,360 31	1,559 41	1,545 63	876 60	1,669 33
Hamilton.....	66 42	11 02	55 40	160 10	2 79	157 31	128 49	5 61	122 88
Herkimer.....	970 50	829 66	140 84	744 65	444 48	300 17	1,030 00	788 38	241 62
Jefferson.....	42,622 28	37,598 45	5,023 83	34,969 87	28,004 55	6,965 32	17,490 05	16,349 98	1,140 07
Kings.....	7,632 41	5,242 77	2,389 64	6,583 48	3,655 51	2,927 97	6,779 12	3,969 04	2,810 08
Lewis.....	787 53	787 53	0 00	479 17	331 60	147 57	512 31	452 64	59 67
Madison.....	153,544 96	28,153 40	125,391 56	234,214 63	19,730 07	214,484 55	259,788 93	17,196 86	242,592 05
	13,234 16	3,960 87	9,273 29	14,814 24	4,036 34	10,777 90	8,917 29	2,729 43	6,187 86
	25 44	4 37	21 07	115 43	115 43	115 43	138 46	138 46	138 46

ANNUAL REPORT OF THE COMPTROLLER.

COUNTRIES.	1878.				1879.				1880.			
	Returned.	Admitted.	Rejected.	Rejected taxes corrected and subsequently admitted.	Returned.	Admitted.	Rejected.	Rejected taxes corrected and subsequently admitted.	Returned.	Admitted.	Rejected.	Rejected taxes corrected and subsequently admitted.
Niagara	\$ 6,751 23	\$ 5,302 77	\$ 878 49	\$ 381 11	\$ 3,838 95	\$ 1,594 50	\$ 1,944 45	\$ 524 04	\$ 2,760 49	\$ 2,135 91	\$ 824 58	
Oneida	5,215 11	2,009 79	3,205 32	183 55	67 48	63 79	3 69		651 95	341 22	310 73	
Orange	163 55	157 54	6 01									
Orleans	594 96	41 17	553 79									
Richmond	28,096 45	21,082 22	6,994 23	801 05	15,563 97	9,236 16	6,287 81	1,231 93	12,906 28	9,341 50	3,624 78	
Rockland	11,479 73	8,547 93	2,931 85	1,583 27	9,072 90	6,081 41	2,991 49	1,345 89	7,214 04	4,720 35	2,494 29	
Saratoga	3,964 46	994 52	2,969 94	23 60	2,936 04	639 22	2,296 82	11 43	1,248 41	280 22	968 19	
Schuyler									124 56	70 93	53 63	
Seneca									304 08	220 81	83 27	
St. Lawrence	10,090 33	8,572 30	1,517 53	66 10	6,131 04	5,390 67	740 37	193 98	5,264 82	4,448 37	816 45	
Steuben	1,999 21	71 30	1,927 91		349 32	61 44	287 88		235 09	52 22	222 77	
Tioga	372 53	319 83	52 70		108 14	109 92	58 22		610 60	480 63	129 97	
Tompkins	191 50	16 10	175 40	51 42	328 76	311 84	16 92	2 19	187 50	97 58	80 92	
Warren	8,215 24	4,992 11	3,223 13	361 05	7,874 32	4,909 23	3,265 00	373 38	5,620 43	3,063 75	2,436 67	
Washington	201 45	155 73	45 73		106 29	74 54	31 75		168 20	30 10	138 10	
Wyoming					54 17	48 88	5 29	5 56	27 53	24 35	3 18	
Yates	23 18	1 70	20 48		78 40		78 40					
Total	\$372,838 50	\$179,233 27	\$193,540 23	\$6,823 72	\$384,630 99	\$119,816 00	\$264,814 99	\$8,372 44	\$372,457 18	\$94,424 55	\$278,012 02	

INDEX.

	APPENDIX.	PAGE.
Appropriations for educational purposes.....		16
Appropriations required for year commencing October 1, 1882,	VI.	54
Auction duties.....		20
Auction duties, receipts.....	VII.	66
Balances due to and from the treasury.....		22
Balances due from counties.....		25
Bounty debt.....		11
Bounty Debt Sinking Fund.....		11
Canal debt and canal revenues.....		14
Capitol, new.....		19
Charitable institutions		17
Clerks in the public offices, names and salaries.....	V.	51
College Land Scrip Fund.....		10
College Land Scrip, report of J. W. Williams,, treasurer Cornell University, in respect to.....	XIV.	76
Convicts in State prison.....		19
Corporations, taxation of.....		25
Debt of the State.....		14
Elmira Female College Educational Fund.....		11
Estimates for the current fiscal year.....	III.	45
Estimates for the year commencing October 1, 1882.....	VI.	54
Expenditures for educational purposes.....		16
General Fund, receipts on account of.....	I.	29
General Fund, warrants drawn on.....	II.	31
General Fund, revenue, etc.....		13
General Fund Debt.....		14
Increase of taxation.....	XII.	74
Indian annuities, payment of.....	II.	38
Legislature, expenses of.....	II.	35
Literature Fund.....		7
Mariners' Fund.....		9
Military, payments on account of.....	II.	37
Military Record Fund.....		11

	APPENDIX.	PAGE.
Miscellaneous expenses, payment of.....	II.	43
National Guard, payments on account of.....	II.	37
New Capitol.....		19
Non-resident taxes, returned, admitted and rejected.....	XV.	77
Onondaga salt springs, report of superintendent.....	VIII.	67
Patients in asylums.....		17
Printing, payments for.....	II.	36
Public offices, fees of.....	I.	29
Public offices, payments for postage.....	II.	34
Receipts and expenditures.....		21
Receipts and payments.....		12
Revenues.....		13
Salt duties.....		21
Schedules.....		27
School Fund.....		5
School Fund, increase.....		6
State Asylums for the insane.....		17
State debt.....		14
State of the treasury.....		22
State prisons.....		18
State prisons, expenses of.....	II.	42
State prisons, receipts of.....	I.	30
State tax, rate of, from 1816 to 1881.....	XIII.	75
Stationery delivered to the public offices.....	IX.	69
Supplementary statement.....		14
Taxation of corporations.....		25
Taxation and valuation.....		23
Taxes for 1859 and 1881.....		24
Taxes levied in 1879.....	IV.	50
Taxes, tables of valuation, etc.....	X, XI.	70, 73
Taxes, non-resident returned, admitted and rejected.....	XV.	77
Treasury, state of.....		22
Trust funds.....		5
United States Deposit Fund.....		8
Valuation of real and personal property and State and local taxes.....	XII.	74

STATE OF NEW YORK.

No. 4.

IN ASSEMBLY,

JANUARY 5, 1882.

ANNUAL FINANCIAL REPORT
OF THE AUDITOR OF THE CANAL DEPARTMENT.

STATE OF NEW YORK :

CANAL DEPARTMENT,

ALBANY, *January 5, 1882.* }

To the Speaker of the Assembly :

As required by law, I have the honor herewith to transmit the Annual Financial Report of this Department, for the fiscal year ending September 30, 1881.

Respectfully yours,

JOHN A. PLACE,

Auditor.

[Assem. Doc. No. 4.]

1

FINANCIAL REPORT OF THE AUDITOR.

STATE OF NEW YORK :

CANAL DEPARTMENT,
ALBANY, *December 10, 1881.* }

To the Legislature :

In compliance with the provisions of act chapter 177 of the Laws of 1861, I respectfully submit the following report of the receipts and payments on account of the canals and canal debt, and the balances of the funds on hand, the depositories of the same, and the condition thereof at the close of the fiscal year which ended September 30, 1881.

REVENUES AND EXPENDITURES OF THE FISCAL YEAR.

Statement of the revenues of the canals, with the expenses of collecting the tolls, and ordinary repairs, during the fiscal year which ended September 30, 1881 :

Receipts.

Tolls	\$810,532 05
Rent of surplus water	1,535 00
Miscellaneous.....	6,197 56
	<hr/>
	\$818,264 61

Payments for ordinary repairs, etc. :

To Superintendent of Public Works	
for ordinary repairs	\$425,366 99
To engineers for ordinary repairs.....	30,000 00
To section superintendents, for ordinary repairs.....	440,887 21
	<hr/>

Total expenditures for ordinary
repairs..... \$896,254 20

Carried forward.....	\$896,254 20	\$818,264 61
----------------------	--------------	--------------

Brought forward.....	\$896,254 20	\$818,264 61
To collectors for salaries, clerk hire, pay of inspectors, and expenses of collectors' offices.	\$40,048 91	
To weigh-masters and assistants..	4,848 35	
Total amount for collecting reve- nue.....	44,897 26	
For salaries chargeable to the annual revenues, refunding tolls, printing and other miscellaneous expendi- tures.....	82,755 60	1,023,907 06
Deficiency in the revenues of the canals for the fiscal year which ended September 30, 1881..		\$205,642 45

This deficiency in the revenues of the canals, amounting to \$205,-642.45, was supplied from the fund for extraordinary repairs in pur-
sance of section 2 of act chapter 449 of the Laws of 1881.

SUMMARY STATEMENT.

The financial condition of the canals for the last fiscal year is as follows:

Balance in the treasury, and invested October 1, 1880,	\$3,322,644 82
Received from all sources during the fiscal year which ended September 30, 1881.....	1,823,837 73
	\$5,146,482 55
Paid during the same period.....	1,750,344 13
Leaving a balance September 30, 1881.....	\$3,396,138 42

Said balance is deposited and invested as follows, viz.:

Amount deposited in banks (see No. 49)	\$1,884,639 42
Amount invested in United States bonds, 4½s of 1891,	715,000 00
Amount invested in United States bonds, 5s of 1881 (continued).....	792,700 00
Real estate, etc., Bank of Corning.....	3,799 00
	\$3,396,138 42

Canal Debt Paying Interest September 30, 1881.

	Principal.	Annual interest.
Under article 7, section 3 of the Constitution	\$8,976,700 00	\$538,602 00

Debt after balances of Sinking Funds have been applied.

	Total canal debt Sept. 30, 1881.	Bal'nc's of Sinking Funds Sep. 30, 1881, including investments.	Balance of debt after applying Sinking Funds.
Under article 7, section 1 of the Constitution.....	\$6,160 00	\$6,160 00	.....
Under article 7, section 3 of the Constitution.....	8,977,200 00	2,416,821 57	\$6,560,378 43
	<u>\$8,983,360 00</u>	<u>\$2,422,981 57</u>	<u>\$6,560,378 43</u>

Debt after applying all the sinking funds. \$6,560,378 43

Canal Debt Outstanding.

	Not paying interest.	Paying interest.
1837.....	\$160 00	.....
1873.....	500 00	.....
1874.....	6,000 00	.....
1883.....	.....	\$638,200 00
1887.....	.....	1,562,900 00
1891.....	.....	4,302,600 00
1892.....	.....	2,000,000 00
1893.....	.....	473,000 00
Amount paying interest.....		<u>\$8,976,700 00</u>
Amount not paying interest.....		<u>6,660 00</u>
Total debt		<u><u>\$8,983,360 00</u></u>

The interest on the debt not matured, which is at the rate of 6 per cent, amounts to \$538,602 per annum.

These stocks were, on the 30th September, 1881, held as follows:

In the United States	\$8,019,900 00
In foreign countries.....	956,800 00
	<u><u>\$8,976,700 00</u></u>

REVENUES — COMPARATIVE STATEMENT.

The following statement shows the aggregate receipts and payments on account of the ordinary expenses of the canals for the last two fiscal years :

	1880.	1881.
Receipts from tolls.....	\$1,183,352 74	\$810,532 05
Receipts from rent of surplus water	2,177 08	1,535 00
Recei'ts from miscellan'us sources,	14,604 81	6,197 56
Total revenue for the year...	\$1,200,134 63	\$818,264 61

	1880.	1881.
Payments to section superintend- ents for ordinary repairs.....	\$436,180 12	\$440,887 21
Payments by Superintendent of Public Works for ordinary re- pairs	297,005 71	425,366 99
Payments to division engineers for ordinary repairs.....	30,000 00	30,000 00
Payments to collectors and their assistants	46,267 02	40,048 91
Payments to weigh-masters and their assistants.....	5,642 87	4,848 35
Refunding tolls, salaries of offi- cers and miscellaneous expenses chargeable to the revenues of the canals.....	73,920 12	82,755 60
Total expenses for the year..	\$889,015 84	\$1,023,907 06
Surplus of revenue in 1880.....	\$311,118 79	
Deficiency of revenue in 1881.....		\$205,642 45

In order to meet the provisions of the third section of article seven of the Constitution, the revenues for the past year should have been sufficient for the following purposes, viz. :

To pay the cost of collection, superintendence and ordinary repairs of the canals	\$1,023,907 06
To pay the interest on the canal debt.....	538,602 00
Carried forward.....	\$1,562,509 06

Brought forward.....	\$1,562,509 06
To pay the annual contribution to the sinking fund for the extinguishment of the principal of the debt,	450,000 00
To pay the general fund for the support of govern- ment.....	200,000 00
Total revenue required....	\$2,212,509 06
Total revenue received.....	818,264 61
Deficiency of revenue for the year ended 30th September, 1881.....	\$1,394,244 45

Document No. 57, on another page of this report, gives in tabulated form the tolls collected, the expenses of collection and repairs, the per cent of cost of maintenance on tolls for each year, commencing with 1826, and the tonnage of all canals, commencing with 1836.

Document No. 58, following, is a statement in tabular form, showing the receipts of tolls, the expenses of collection and repairs, and the surplus revenues in each year, commencing with 1836.

THE CANAL DEBT SINKING FUNDS.

The condition of the several sinking funds for the payment of the canal debt stocks, on the 30th September, 1881, was as follows:

Sinking Fund — Article 7, Section 1.

The balance to the credit of this fund on the 30th September, 1881, was \$6,160. This balance represents the amount of the certificates of matured stock which have not been presented for redemption.

Sinking Fund — Article 7, Section 3.

The balance, standing to the credit of this fund on the 30th September, 1880, was.....	\$2,045,320 17
The receipts for the fiscal year which ended Septem- ber 30, 1881, were :	
From taxes levied pursuant to chapter 248, Laws of 1880, to supply the deficiency for the year 1879..	878,938 03
Interest on investments and deposits	80,773 66
Proceeds of sales of material on abandoned lateral canals, to wit: the Chemung, Chenango and Genesee Valley.....	13,034 96
Carried forward.....	\$3,018,066 82

Brought forward.....	\$3,018,066 82
The payments during the fiscal year were :	
Interest on the stock debt.....	\$538,602 00
Premium paid on stock investment, viz. :	
On \$475,000 U. S. 4½s of 1891.....	\$55,218 75
On \$5,000 N. Y. State 6s of 1883	362 50
	<hr/> 55,581 25
Cancellation of stock, 6s, 1st January, 1883	5,000 00
Bank of Manhattan Company, for keeping transfer office	1,250 00
Salary of transfer agent at New York,	750 00
Printing and stationery for transfer office	62 00
	<hr/> 601,245 25
Leaving a balance, September 30, 1881	<hr/> \$2,416,821 57

This balance of \$2,416,821 57 was held as follows:

On deposit in banks	\$909,121 57
Invested in bonds of the United States, viz. :	
Four and one-halves of 1891.....	\$715,000 00
Fives of 1881, continued at 3½.....	792,700 00
	<hr/> 1,507,700 00
	<hr/> \$2,416,821 57

In addition to this balance on deposit and invested, there is due the fund \$758,797 92, being the deficiency in the contributions from the revenues of the canals for the fiscal year which ended 30th September, 1880, and the interest thereon, for which a tax was authorized by chapter 595 of the Laws of 1881, and is now in process of assessment and collection.

There should have been contributed from the revenues of the last fiscal year to meet appropriations :

For the payment of interest on stock debt	\$538,602 00
For the sinking fund.....	450,000 00
	<hr/>
Total appropriated and not realized	\$988,602 00
	<hr/>
Carried forward.....	\$988,602 00

Brought forward.....	\$988,602 00
Add for deficiency in taxes of 1880.....	17,098 59
Add for interest on these deficiencies from the time due until the same can be realized from tax.....	80,456 05
Amount to be supplied by tax.....	\$1,086,156 64

which is equal to about 42-100 of a mill on the present valuation.

UNAVAILABLE DEPOSITS.

The total amount deposited in banks unavailable, at the close of the fiscal year which ended September 30, 1880 (see page 45 of last report), was..... \$130,667 00

There has been collected during the fiscal year which ended September 30, 1881:

From receiver of New York and Erie Bank, Buffalo, in compromise of balance of \$34,629 26, pursuant to chapter 497 of Laws of 1880.....	\$27,207 66	
Balance of account of New York and Erie Bank of Buffalo, charged to fund for the enlargement and com- pletion	7,421 60	34,629 26
Leaving unavailable, September 30, 1881		\$96,037 74

Document No. 49, on another page of this report, is a statement showing balance on hand 30th September, 1881, how deposited and invested, together with the names of the accounts to which it belongs. The available and unavailable deposits appear in said statement separately.

RECEIPTS AND EXPENDITURES ON ACCOUNT OF THE CANALS.

The receipts from tolls and other sources of income other than taxes, and the expenditures on account of each and all the canals for the fiscal year which ended September 30, 1881, will be found in detail in documents 26 to 47, inclusive. The substance of these several accounts, in a condensed form, is exhibited in the following tabulation :

TABLE

Showing for each Canal: 1. The income derived from tolls and other sources. 2. Payments for collection, ordinary repairs and miscellaneous charges on the revenues. 3. The surplus of revenue or profit in operating. 4. The deficiency of revenue, or loss in operating. 5. Payments from proceeds of taxes for extraordinary repairs, damages and other purposes. 6. Total payments from earnings and taxes. 7. Income in excess of all payments. 8. Payments in excess of income.

(The period embraced in this table is for the fiscal year ending 30th September, 1881.)

CANALS.								
	1	2	3	4	5	6	7	8
	Income from tolls and other sources.	Cost of collection of miscellaneous charges and ordinary repairs and on revenues.	Surplus of revenue.	Deficiency of revenue.	Payments for extraordinary repairs, enlargements, awards of Canal, appraisers and Canal Board.	Total payments.	Income in excess of all payments.	Payments in excess of income.
Erie	\$753,105 79	\$705,300 68	.....	\$12,104 89	\$14,834 28	\$780,134 98	.....	\$27,029 17
Champlain	87,703 95	114,411 76	.....	70,707 81	91,483 96	235,845 74	.....	108,191 79
Oswego	18,745 16	43,613 76	.....	29,898 60	.....	43,613 76	.....	29,898 60
Cayuga and Seneca	1,086 27	14,963 26	.....	13,987 99	.....	14,963 26	.....	13,987 99
Chemung .....	.....	6,103 47	.....	6,103 47	.....	6,103 47	.....	6,103 47
Chenango .....	.....	4,345 04	.....	4,345 04	791 15	5,136 19	.....	6,138 19
Black River	12,062 47	71,580 15	.....	59,736 68	9 248 35	81,037 50	.....	68,965 03
Genesee Valley .....	.....	8,342 56	.....	8,342 56	.....	3,342 56	.....	8,342 56
Oneida Lake .....	.....	.....	\$454 66	.....	.....	.....	\$454 66	.....
Oneida River Improvement	454 66	.....	32 54	.....	.....	37 38	32 54	.....
Seneca River T. w. path	32 54	.....	37 38	.....	.....	.....	37 38	.....
Cayuga Inlet	74 77	.....	.....	.....	156 81	.....	.....	156 81
Crooked Lake .....	.....	.....	.....	.....	.....	.....	.....	.....
	\$818,264 61	\$1,023,907 06	\$424 50	\$206,167 04	\$116,514 57	\$1,140,421 63	\$524 50	\$322,681 61

The preceding table shows at a glance the financial operations of all the canals for the last fiscal year.

The total income from tolls and other sources exhibited in column 1, was.....	\$818,264 61
The payments for collection, ordinary repairs, and such miscellaneous expenses as are a legitimate charge, under the Constitution, upon the revenues, as shown in column 2, were, in the aggregate	1,023,907 06
<hr/>	
The expenditures for maintenance exceeding the income by.....	\$205,642 45
<hr/>	

This failure in the revenues to meet the appropriations for the ordinary repairs, superintendence and other expenses attending the operation of the canals was supplied from moneys belonging to the extraordinary repair fund in pursuance of the second section of act chapter 449 of the Laws of 1881, which reads as follows :

“The sum of three hundred thousand dollars, or so much thereof as may be necessary, is hereby appropriated out of the unexpended moneys in the treasury standing to the credit of the fund for extraordinary repairs, to make good any failure in the revenues of the canals for the fiscal years ending September thirtieth and commencing October first, eighteen hundred and eighty-one, to meet opportunely or to pay in full the appropriations for the ordinary repairs and expenses of the canals. The said sum of three hundred thousand dollars, hereby temporarily and contingently appropriated, shall be replaced in the original fund from the revenues of the canals for the said years, or whenever they shall be sufficient to admit of a partial or complete restoration.”

The profit and loss in operating the several canals are shown separately and in the aggregate in columns 3 and 4.

The profitable canals earned (see column 3).....	\$524 59
The non-paying canals lost (see column 4)	206,167 04
<hr/>	

The amount paid on account of each and all the canals, from the proceeds of taxes levied prior to 1875, for extraordinary repairs and improvements, for awards made by the Canal Appraisers and the Canal Board and the interest thereon, is shown in column 5. In detail the expenditures were as follows :

On Account Erie Canal.

For extraordinary repairs.....	\$5,829 75	
For awards of Canal Appraisers and the interest thereon.....	3,918 81	
For awards of Canal Board.....	5,085 72	
	<hr/>	\$14,834 28

On Account Champlain Canal.

For improvement.....	\$86,852 57	
For awards of Canal Appraisers and the interest thereon	4,631 41	
	<hr/>	91,483 98

On Account Chenango Canal.

For awards of Canal Appraisers and interest thereon,	791 15
--	--------

On Account Black River Canal.

For awards of Canal Appraisers and interest thereon,	9,248 35
--	----------

On Account Crooked Lake Canal.

For awards of Canal Appraisers and interest thereon,	156 81
--	--------

The aggregate was.....	<hr/>	\$116,514 57
------------------------	-------	--------------

The total income from tolls and other sources, other than taxes, as shown in column 1, was.....	\$818,264 61
--	--------------

The total payments on account of all the canals, from their revenues and from the proceeds of taxes, as shown in column 6, being the product of columns 2 and 5, were	1,140,421 63
--	--------------

Payments in excess of income.....	<hr/>	\$322,157 02
-----------------------------------	-------	--------------

Columns 7 and 8 show the income of each canal in excess of all disbursements, or the disbursements in excess of income, as the case may be.

It will doubtless be observed that the expenditures for collection, superintendence and ordinary repairs for the fiscal year which ended September 30, 1881, have been \$134,891.22 in excess of the previous year; but this sum, to its full extent, was expended for necessary work which had been unavoidably postponed in consequence of the diminished revenues of the years 1878-79, and for material which will be

used for reparation the current fiscal year, and will thus, in a corresponding degree, diminish the cost of maintenance for the year which commenced October 1, 1881.

The necessity for the purchase of material in one year for consumption in the succeeding year is due to that clause in the Constitution which limits the expenditure in any one year to the amount of the gross income of the previous year. This precautionary measure, with the aid of a contingent appropriation from the extraordinary repair fund which happily has neither been diverted nor exhausted, will enable the Superintendent of Public Works to maintain navigation to the close of the present fiscal year, which ends September 30, 1882, unless expensive breaks should occur, even though there should be a considerable falling off in revenue. The income of the past year having been \$818,264 61, that amount may be expended, which, with the material on hand, will suffice, except in the contingency of disastrous breaks.

A crisis however is near at hand, and it will devolve upon the present Legislature to adopt measures to meet it. Unless the present Constitution shall be amended so as to become operative January 1, 1883, the expenditures for the year which will commence October 1, 1882, less than one year hence, will be limited to the amount of the income for the current fiscal year which ends September 30, 1882. If the income for this present year shall fall below a sum sufficient for a year's maintenance; then the canals must cease to be operated by the State after the close of the calendar year 1882, or under the most favorable circumstances, after July 1, 1883.

This approaching crisis is too probable to be ignored, and is one which cannot successfully be surmounted by any condition of the crops here and abroad. Besides, it matters not what may be the result of the next harvest, or what may be the income for the year beginning October 1, 1882, as the expenditures for that year must be limited to the amount earned this year. We know that the crops of 1881 were less productive than those of 1880, and that the export demand has fallen off. Hence, there is no reason to hope that the canal tonnage from the opening of navigation to September 30, 1882, will exceed that for the corresponding period in 1881, while there is every reason to apprehend that it may be less, and that the revenues under the present rates of toll may also decline.

ESTIMATED RECEIPTS FOR YEAR ENDING SEPTEMBER 30, 1882.

If the tonnage moved on the canals in 1882 shall correspond with that of the past season, we may estimate the revenues from tolls, if no change shall be made in the rates, as follows:

Actual receipts from the 1st September, 1881, to the close of navigation	\$266,008 41
Estimated receipts from opening of navigation in the spring of 1882, to September 1st of the same year,	364,000 00
<hr/>	
Total estimated gross receipts for fiscal year ending September 30, 1882.....	\$630,008 41
<hr/>	

This estimated sum, if realized, would be the limit of expenditures for the fiscal year beginning October 1, 1882—a sum which was necessarily expended the past year before the close of the month of June—three months short of a full year.

It is therefore apparent that the income of the canals must either be increased by additional tolls,—a plan which must depend entirely upon the concurrence of competing railroads for its success, or else the Constitution must speedily be amended with respect to the limitation of expenditures.

PROPOSED AMENDMENTS OF THE CONSTITUTION.

Two sets of resolutions proposing amendments of the Constitution in relation to the canals have passed the Legislature, and before either can be submitted to the people, it must be concurred in by the present Legislature.

The first in order passed the Legislature of 1880, and reads as follows:

Concurrent Resolutions

Proposing amendments to Article seven of the Constitution, and providing for the maintenance of the canals by the revenues thereof.

Resolved (if the Senate concur), That section three of article seven of the Constitution be amended so as to read as follows:

§ 3. The debts mentioned in the preceding sections of this article having been fully paid or provided for, and no longer liens upon the revenues of the canals, the surplus revenues of the canals, after paying the cost of collection, superintendence and ordinary repairs, shall in each fiscal year be credited to the reserve fund created under the sixth section of this article, and held to meet appropriations as therein provided. The rates of toll established for the year one thousand eight hundred and eighty, on persons and property transported on the canals, shall neither be increased nor reduced except by the Canal Board, with the concurrence of the Legislature. All contracts for work or materials on any canal shall be made with the person who shall offer to do or provide the same at the lowest price with adequate security for their performance. No extra compensation shall be made to any contractor; but if, from any unforeseen cause, the terms of any contract shall prove to be unjust and oppressive, the Canal Board may, upon the application of the contractor, cancel such contract. The

Legislature shall not sell, lease, or otherwise dispose of the Erie canal, the Oswego canal, the Champlain canal, the Cayuga and Seneca canal, or the Black River canal; but they shall remain the property of the State, and under its management forever.

Resolved (if the Senate concur), That section five of article seven of the Constitution be amended so as to read as follows:

§ 5. There shall annually be imposed and levied a tax which shall be sufficient to pay the interest, and extinguish the principal of the canal debt, as the same shall become due and payable, and the proceeds of such tax shall, in each fiscal year, be appropriated and set apart for the sinking fund constituted for the payment of the principal and the interest of the aforesaid debt.

Resolved (if the Senate concur), That section six of article seven of the Constitution be amended so as to read as follows:

§ 6. There shall be created a canal repair trust fund, under the control and management of the commissioners of the canal fund, which shall be made up and sustained in the following manner:

1. By the transfer thereto of any unexpended moneys remaining in the treasury at the time of the adoption of this section, belonging to the canal fund and standing on the books of the Canal Department to the credit of the "fund for extraordinary repairs," the "fund for the enlargement of the Champlain canal," and the "fund for the reconstruction of the Oneida Lake canal."

2. From the surplus revenues in each fiscal year, after paying the expenses of collection, superintendence and ordinary repairs of the canals.

All of which fund so hereby created shall be separately kept and safely invested by the Commissioners of the Canal Fund, and may, under the direction and enactment of the Legislature, from time to time, be appropriated to make good any failure in the revenues to meet the appropriations for the ordinary expenditures, or for the permanent improvement of the canals.

The effect of the foregoing amendment, if adopted, would be to relieve the canal revenues from all liability for the payment of the principal and interest of the canal debt. The surplus revenues, if any, instead of being contributed to a sinking fund, as now, would be held in reserve to supply, from time to time, any deficiency in the revenues to meet appropriations for the ordinary expenditures or for permanent improvements. The clause in the present Constitution which limits all expenditures to the amount of income would be eliminated, and the Legislature could at all times supply any deficiency in the revenues or the reserve fund, or appropriate moneys for improvements from the proceeds of taxes.

The apparent design, however, is to make the revenues of the canals sufficient to defray the cost of maintenance; but there is nothing to prevent the Canal Board and the Legislature, acting concurrently, from reducing tolls to a nominal rate whenever necessary to retain trade, and supplying any deficiency in revenue by taxation.

Under this plan there would be no danger of the canals being closed for want of means to maintain them, except a refusal on the part of the Legislature to authorize a tax to meet the appropriations.

The second plan, which passed the Legislature of 1881, reads as follows.

Concurrent Resolutions

Proposing amendments to article seven of the Constitution, and providing for the abolition of tolls on the canals and the maintenance thereof by taxation.

Resolved (if the Assembly concur), That section third of article seven of the Constitution be amended so as to read as follows:

§ 3. The first and second sections of this article having been fully complied with, no tolls shall hereafter be imposed on persons or property transported on the canals, but all boats navigating the canals, and the owners and masters thereof, shall be subject to such laws and regulations as have been or may hereafter be enacted concerning the navigation of the canals.

The Legislature shall, annually, by equitable taxes, make provision for the expenses of the superintendence and repairs of the canals. The canal debt contracted under the section hereby amended, which, on the first day of October, eighteen hundred and eighty, amounted to eight million nine hundred and eighty-two thousand two hundred dollars, shall continue to be known as the "canal debt under article seven, section three of the Constitution," and the sinking fund applicable to the payment thereof, together with the contributions to be made thereto, shall continue to be known as the "canal debt sinking fund," and the principal and interest of said debt shall be met as provided in the fifth section of this article. All contracts for work or materials on any canal shall be made with the person who shall offer to do or provide the same at the lowest price, with adequate security for their performance. No extra compensation shall be made to any contractor; but if, from any unforeseen cause, the terms of any contract shall prove to be unjust and oppressive, the Canal Board may, upon the application of the contractor, cancel such contract.

Resolved (if the Assembly concur), That section five of article seven of the Constitution be amended so as to read as follows:

§ 5. There shall annually be imposed and levied a tax, which shall be sufficient to pay the interest and extinguish the principal of the canal debt mentioned in the third section of this article, as the same shall become due and payable, and the proceeds of such tax shall, in each fiscal year, be appropriated and set apart for the sinking fund constituted for the payment of the principal and the interest of the aforesaid debt. But the Legislature may, in its discretion, impose for the fiscal year beginning on the first day of October, eighteen hundred and eighty-three, a State tax on each dollar of the valuation of the property in this State, which may by law then be subject to taxation, sufficient, with the accumulations of the sinking fund applicable thereto, to pay in full both the principal and interest of the canal debt before mentioned, and the proceeds of such tax shall be appropriated and set

apart for the sinking fund constituted for the payment of the principal and interest of said debt. In the event of such action by the Legislature, then the Legislature shall, under the law directing the assessment and levy of such tax, make such provision for the retirement of the canal debt as it shall deem equitable and just to the creditors of the State.

Resolved (if the Assembly concur), That section six of article seven of the Constitution be amended so as to read as follows :

§ 6. The Legislature shall not sell, lease or otherwise dispose of the Erie canal, the Oswego canal, the Champlain canal, the Cayuga and Seneca canal, or the Black River canal ; but they shall remain the property of the State and under its management forever. All funds that may be derived from any lease, sale or other disposition of any canal shall be applied in payment of the canal debt mentioned in the third section of this article.

This last amendment, originally introduced by Hon. Isaac I. Hayes in the Assembly of 1878, as its title indicates, proposes a free canal, and makes it incumbent upon the Legislature to make provision for its maintenance annually by equitable taxes. Its adoption would also eliminate the limitation clause and clothe the Legislature with ample power to provide for improvements.

It is this last-mentioned plan which both political parties, at their last conventions, resolved should be submitted to the people, and it is also the plan which is most favored by those persons who are directly identified with the commercial interests of the State. If this proposed amendment, making the canals absolutely free, shall be submitted at the next general election and adopted, it will be in force from and including the first day of January, 1883 ; but if it should be rejected, then the first-mentioned plan could subsequently be concurred in and submitted by the Legislature of 1883.

It may be asked : If transportation by canal is more economical than by railroad, the canal will support itself ; and if not, why should the State support it ?

If the canal is to be maintained merely to serve as a regulator of freight charges by rail, then why will not the competition of the Welland canal and the Mississippi route, without the aid of the Erie canal, serve that purpose ?

Will not a free canal, supported by the State, add materially and unjustly to the taxes of those counties which do not touch the canal ?

It is an indisputable fact that the water-route through the lakes and our canals affords the cheapest means of transportation to and from the west, and that property can be transported through it at lower rates with profit to the carrier, than actual cost by rail, besides contributing in tolls sufficient revenue to maintain the canals. The canals, however, labor under this disadvantage. The water-route is only avail-

able for seven months in the year, and while in operation the competing railways will carry freight without regard to cost if such action is necessary to divert it from the canals ; and whatever loss may be sustained in this effort is soon recovered by an advance in rates after navigation closes.

In fact so long as our Constitution contains that clause which limits expenditures in one year to the amount of the previous year's income, the canals are completely at the mercy of the railways. One year of deficient crops, and rail-rates below the cost of carriage by water, will leave the canals the succeeding year without the necessary means to lawfully operate them.

If the canals shall be abandoned—for leaving them without adequate provision for their maintenance is a virtual abandonment—then the State will be deprived of one of its principal arteries of trade, and the strongest competitor of the railways will be extinguished.

It is true that the Mississippi route, and the Welland canal, in connection with the large fleet of lake-craft which now acts as tender to our canals, would still be left as competitors, and to some extent would serve as regulators of rail-rates, but the surplus freight which our own railways could not carry, instead of passing through the Erie canal as now, would be diverted elsewhere. The city of New York would be entirely dependent upon the railways and would possess no greater facilities than Baltimore, Philadelphia and Boston. The railways through our State would rely more upon excessive rates for profits than upon the quantity of freight transported.

The counties of New York, Kings, Westchester and Erie are essentially commercial, and their growth and prosperity have been promoted mainly through the instrumentality of the canals. Prior to the opening of the Erie canal, these counties paid only thirty-three per cent of the aggregate of the State taxes, while now they pay sixty-two per cent; the remaining counties, instead of paying sixty-seven per cent as formerly, now pay only thirty-eight per cent of the aggregate—a reduction of twenty-nine per cent. If these commercial counties should lose the business of the canals, and be deprived of the benefits of their competition, their valuations would inevitably decline, and the proportion of taxes to be paid by the remaining counties would be increased correspondingly.

In consequence of the illiberal policy which, under the present Constitution, controls the management, and the uncertainty which surrounds the future of the canals, the decline of the commercial counties has already commenced. The aggregate equalized valuations (upon which taxes are assessed) of the counties of New York, Kings and Westchester, from 1878 to 1880, declined more than \$84,000,000. This

is confirmatory of what is frequently asserted, that capital has been and is being transferred from New York to Baltimore and other rival ports, and it will continue to be thus transferred until the business which is now being diverted shall be restored, or the diversion checked.

The efforts which are being made to intercept and divert business from this State are almost beyond conception, and are of such proportions that it is a matter of grave doubt whether we can hold our own.

If we desire to retain even the volume of business we have hitherto controlled, it can only be accomplished by increased effort, and by making the best use of our present facilities. The State of New York cannot maintain its present commercial position without the exercise of greater enterprise and liberality than has prevailed of late years. With a State debt of only \$6,500,000 in excess of its sinking fund, we seem paralyzed at the thought of maintaining our greatest avenue of commerce at the public expense, while we are being surrounded with a perfect net-work of railroads constructed for no other purpose than to intercept and divert from us the business which the enterprise and foresight of a previous generation developed and secured. The traffic in western products is now intercepted at the place of production by the avenues of rival States; and possibly within a year, by means of branches now in process of construction, Baltimore and Philadelphia will intercept our canal business at Buffalo with more extensive rail connections than the city of New York can command.

BUSINESS SEASON OF 1881 — RESULTS COMPARED WITH PREVIOUS YEARS.

There has been a large falling off in tonnage and tolls for the navigation year of 1881, as compared with the previous year.

The tons moved in 1880 were.....	6,457,656
The tons moved in 1881 were.....	5,175,505
A loss in 1881 of.....	1,282,151

Equal to 20 per cent.

The tolls received were in 1880	\$1,155,418 84
The tolls received were in 1881	632,360 02
A loss in 1881 of.....	\$523,038 82

Equal to 45 per cent.

This loss in revenue is partly due to the removal of tolls on west-bound freight. As a rule the freight ascending the canals is only

about one-third of the amount moving toward tide-water, and the consequence of this unequal movement is that many boats are compelled to make their return trips from tide-water without cargoes, thus taxing the east-bound freight with the entire expenses of the trip.

It was believed that a total remission of tolls on all property moving toward the west would stimulate and largely increase the movement in that direction, and that the compensation derived from this increased movement would enable the carrier to transport the east-bound freight at less cost, and to compete more successfully with the railroads for freight moving toward tide-water. It was also believed that the loss of tolls on the up freight would be gained on the anticipated increased movement in the opposite direction.

The competition for west-bound freight the past season was as active as for the eastward-bound, and a plan which seemed to promise good results proved unsuccessful.

The tons moved west were:

In 1880	1,518,290
In 1881	1,365,418
<hr/>	
A loss in 1881 of	152,872
<hr/>	

This loss in tonnage is equal to 10 per cent, but the east-bound movement shows a loss of over 22 per cent, and it, therefore, may be claimed, and justly perhaps, that the lower percentage of loss on the west-bound movement was due to the remission of tolls.

The fact that reduced tolls, or the total abolition of tolls, has failed to increase the tonnage movement through our canals, is one of the best evidences of the severity of the contest which has prevailed the past season between the transportation routes of this and other States. During a portion of the navigable season all rail-rates from Chicago to the Atlantic sea-board have been nominally as low as the average rates by the water-route, while special rates were at times undoubtedly below the actual cost by water, and less than half the cost by rail.

The railroad war of the past year, so far as the roads of this State were concerned, was probably not so much against the water-route as against the differential rates exacted by the rival roads connecting with Philadelphia and Baltimore. These differential rates, which for years have been conceded for the sake of harmony and profit, have always worked to the detriment of the commercial interests of this State, as a review of the business of the three important ports for a period of years will illustrate.

Such a review will also show the importance of our canals, not only as a regulator of transportation rates, but as a most powerful agent for the prevention of unjust combinations between our own roads and the competing roads of other States.

Prior to 1870, the differential rate conceded to the roads terminating at Philadelphia and Baltimore was two dollars per ton. That is to say: In the arrangement between the several lines of railways for maintaining rates, it was agreed that the charge for transporting freight from western competing points to the city of New York should be two dollars per ton higher than to Philadelphia and Baltimore. Two dollars per ton is equivalent to six cents per bushel of wheat.

In 1869, and for five years prior thereto, the canal tolls on wheat from Buffalo to tide-water were six cents per bushel — a rate which enabled the roads of this State to make that discrimination against the city of New York, in favor of Philadelphia and Baltimore.

In 1870 the canal tolls on wheat and other grain were reduced one-half, and this measure compelled a corresponding reduction in the differential rate to one dollar per ton — precisely the same reduction as was made in tolls. In 1870, the all-rail receipts at New York, of flour, meal and grain (flour and meal reduced to their equivalent in bushels) aggregated 40,195,862 bushels, and the combined receipts at Philadelphia and Baltimore aggregated 29,126,112 bushels — New York receiving 11,069,750 bushels more than the deliveries at Philadelphia and Baltimore combined — or 58 per cent of the total for the three ports.

In 1880, the differential rates in favor of Philadelphia and Baltimore being 60 and 40 cents per ton respectively, the all-rail receipts at New York aggregated 95,414,822 bushels, and at the other two ports, 109,899,520 bushels — New York receiving only 46 per cent of the total delivery at the three ports instead of 58 per cent as in 1870 — almost a complete reversal of the percentages. But if, from the all-rail receipts of New York in 1880, 95,414,822 bushels, we deduct the quantity received by the Pennsylvania railway, 14,813,844 bushels, it leaves 80,601,478 bushels as the quantity actually delivered by the New York roads — being only 39 per cent of the deliveries at the three Atlantic ports, New York, Philadelphia and Baltimore.

In 1870, the all-rail receipts at New York were within 2,032,953 bushels of the combined receipts of Boston, Philadelphia and Baltimore; while in 1880 the receipts at the three ports last named exceeded those of New York by 51,575,703 bushels.

In 1880, the total receipts at New York, including the deliveries by canal, aggregated 170,475,832 bushels, and at the three ports of Boston, Philadelphia and Baltimore, 143,130,967 bushels.

Facts like these afford the strongest proof of the great value of the canals to the State.

They also show the position the city of New York would occupy if deprived of their use. With the canals abandoned, the excessive differential rates which have hitherto prevailed could not be prevented. The growth of the great metropolis would not only be checked, but the immense capital now actively employed would depart from thence to more profitable fields.

This loss of capital and business would be followed by a terrible shrinkage in the value of her real estate, and all the other counties of the State would feel the depressing influence of her decline, and be compelled to contribute a larger proportion of the taxes as the penalty of a short-sighted and illiberal policy.

While conceding differential rates in favor of Philadelphia and Baltimore, the New York railways cannot obtain their fair proportion of business. The railroad war of 1881, although conducted at great loss to all the competing lines and impoverishing the boatmen employed on our canals, has worked beneficially for the interests of New York, as the following statements will affirm :

TOTAL RECEIPTS of flour, meal and grain (flour and meal being reduced to their equivalents in bushels) at the ports named, for eleven months ending November 30, each year.

PORTS.	1880. Bushels.	Per cent of total.	1881. Bushels.	Per cent of total.
New York.....	161,127,892	55.18	135,601,594	56.77
Baltimore.....	53,850,524	18.44	41,451,562	17.35
Philadelphia.....	45,276,697	15.50	27,502,805	11.51
Boston.....	31,762,548	10.88	34,351,780	14.37
Totals.....	292,017,661	100.00	238,907,741	100.00

ALL-RAIL RECEIPTS at ports named, for twelve months 1880, and eleven months ending November 30, 1881.

PORTS.	1880. Bushels.	Per cent of total.	1881. Bushels.	Per cent of total.
New York.....	95,414,822	39.36	91,454,955	46.96
Baltimore.....	60,644,357	25.02	41,451,562	21.28
Philadelphia.....	49,255,163	20.32	27,502,605	14.12
Boston.....	37,091,005	15.30	34,351,780	17.64
Totals.....	242,405,347	100.00	194,760,902	100.00

It is shown by the foregoing statements that for the eleven months ending November 30, 1881, there has been a material falling off in the aggregate of the receipts at the four principal Atlantic ports, as compared with the previous year—the receipts at Boston showing an exceptional gain; but New York's percentage of the aggregate was $1\frac{44}{100}$ per cent higher in 1881 than in 1880.

The all-rail receipts for 1881, as compared with 1880, show that New York gained $7\frac{9}{10}$ per cent, while Baltimore and Philadelphia lost $3\frac{14}{100}$ and $6\frac{1}{2}$ per cent, respectively. At the close of the calendar year of 1881, it will doubtless appear that there has been an increase in the total rail receipts at New York, and that the falling off in the aggregate receipts has been wholly in the deliveries by canal.

The following instructive table, prepared by Mr. Elmore H. Walker, the accomplished statistician of the New York Produce Exchange, will show the total receipts by railways at each of the four principal Atlantic ports for a period of years, and the differential rates conceded to Philadelphia and Baltimore in each year.

RAIL RECEIPTS of flour, meal and all kinds of grain (flour and meal being reckoned at their equivalents in bushels) at New York, Philadelphia, Baltimore and Boston, from 1870 to 1880 inclusive, calendar years, and for first eleven months of 1881.

YEARS.	Differential rail-rate per ton allowed in favor of —		RECEIPTS BY RAILROADS AT							
	Baltimore.	Philadelphia.	New York.		Philadelphia.		Baltimore.		Boston.	
			Bushels.		Bushels.		Bushels.		Bushels.	
1870.....	\$1 00	\$1 00	40,195,982	15,397,011	13,819,101	13,102,708	29,139,112	42,228,815		
1871.....	1 00	1 00	33,018,331	20,102,425	17,389,443	15,037,943	37,491,868	52,529,811		
1872.....	1 00	1 00	36,621,602	24,117,250	20,571,691	16,176,551	44,698,241	61,065,792		
1873.....	1 00	1 00	44,737,769	24,946,559	19,099,517	17,805,908	41,049,074	61,854,980		
1874.....	1 00	1 00	55,705,063	24,625,591	24,938,208	18,400,162	40,561,799	67,961,801		
1875.....	1 00	1 00	54,069,100	22,452,100	22,048,568	18,321,053	44,500,909	62,822,022		
1876.....	1 00	1 00	59,047,953	36,310,565	35,255,176	22,353,698	71,565,741	96,819,439		
1877.....	60	60	50,862,907	23,410,545	35,546,410	23,315,457	60,956,935	84,172,412		
1878.....	60	60	85,350,079	45,414,650	47,015,240	27,391,791	92,429,890	119,721,071		
1879.....	60	60	101,929,243	47,398,455	66,798,211	35,798,889	114,198,668	146,995,405		
1880.....	60	60	95,414,822	46,253,163	60,614,337	37,091,005	109,896,520	146,990,525		
1881.....	.....	.....	91,454,955	27,502,905	41,451,562	34,351,780	68,954,167	103,303,947		

TRANSPORTATION RATES, 1881 — LAKE AND CANAL.

The average rate by canal during the past season was lower than for any previous year, and by lake it was within a fraction of the low averages for 1876 and 1878, when the extreme limit of depression was reached.

For several weeks corn was carried by canal from Buffalo to New York at three and a half cents per bushel, including the toll — netting the carrier a fraction over two and a half cents per bushel, or \$202 72 on a load of 8,000 bushels. This is at the rate of 90½ cents per ton for a carriage of nearly five hundred miles.

The rate by lake, from Chicago to Buffalo for a short period, was as low as one-half cent per bushel, and possibly some grain was carried free for ballast. The average rate for the season by lake was 3¼ cents for wheat, and 2½ cents for corn, per bushel. The prospects for paying freights in the coming spring are very discouraging, as it is stated that one thousand vessels are wintering in the port of Chicago.

The following table exhibits for a period of years the average rate, each year, of lake freight from Chicago to Buffalo, and of canal freight (tolls included) from Buffalo to New York; also the toll per bushel, wheat and corn, from Buffalo to tide-water:

YEARS.	Lake freight from Chicago to Buffalo, per bushel.		Canal freight from Buffalo to New York, per bushel.		Canal tolls from Buffalo to tide-water, per bushel.	
	Wheat.	Corn.	Wheat.	Corn.	Wheat.	Corn.
	Cts. M. Fr.	Cts. M. Fr.	Cts. M. Fr.	Cts. M. Fr.	Cts. M. Fr.	Cts. M. Fr.
1867....	06 6 7	05 4 3	15 6 9	13 3 2	06 2 1	04 8 3
1868....	07 1 4	06 0 5	15 6 5	13 0 1	06 2 1	04 8 3
1869....	06 8 1	06 2 7	16 3 1	13 8 6	06 2 1	04 8 3
1870....	05 8 8	05 4 3	11 2 2	10 3 5	03 1 0	02 9 0
1871....	07 6 2	07 0 6	12 6 2	11 5 4	03 1 0	02 9 0
1872....	11 1 5	10 3 0	13 1 0	11 3 9	03 1 0	02 9 0
1873....	07 6 2	07 2 0	11 5 7	10 2 8	03 1 0	02 9 0
1874....	04 0 3	03 6 7	10 1 1	09 1 1	03 1 0	02 9 0
1875....	03 4 2	03 0 8	08 0 1	07 2 3	02 0 7	01 9 3
1876....	03 1 1	02 6 0	06 7 2	06 0 9	02 0 7	01 9 3
1877....	03 5 7	03 2 3	07 3 9	06 3 8	01 0 3	00 9 6
1878....	03 1 7	02 7 8	05 9 9	05 2 6	01 0 3	00 9 6
1879....	04 7 2	04 2 8	06 9 6	06 1 5	01 0 3	00 9 6
1880....	05 6 4	05 1 5	06 5 8	06 0 1	01 0 3	00 9 6
1881....	03 4 0	02 9 2	04 8 8	04 3 7	01 0 3	00 9 6

An examination of the foregoing table will disclose some singular and almost unaccountable features in connection with tolls and transportation. During the period embraced in the first three years named in the table, when the tolls on wheat were nearly six and a quarter cents per bushel, the freight to the carrier netted \$3.22 per ton. During the next period of five years, 1870 to 1874, with the tolls on wheat reduced to a fraction over three cents per bushel, the average net freight received by the carrier was \$2.87 per ton. During the next period of two years, 1875 and 1876, with tolls on wheat reduced to two cents per bushel, the carrier realized an average of \$1.76 per ton net, and during the last five years, 1877 to 1881, with tolls on wheat reduced to one cent per bushel, the net freight averaged \$1.77 per ton. The average net freight for 1881 was \$1.28 per ton.

CONCLUSION.

The financial results for the last fiscal year are the most discouraging and unsatisfactory of any year in the history of the canals. The revenues, in the aggregate, were lower than for any year since 1825, and for the first time in a period of fifty-six years they not only have failed to make any contribution to the sinking fund for the payment of the principal and interest of the canal debt, but in amount they were actually twenty per cent below the cost of maintenance, or, as shown elsewhere in this report, the expenditures for collection, superintendence and ordinary repairs exceeded the income by \$205,642 45.

If possible, the business of the boatmen has been even more discouraging. Notwithstanding all the efforts of the Legislature and the Canal Board to increase the volume of business by a partial remission of tolls, the earnings of the carrier have steadily declined, and during the last season were entirely unremunerative and doubtless below expenditures.

Unless the equipments which the boatmen supply can be kept profitably employed, there will be no new additions thereto, and those now in existence will be allowed to deteriorate and will soon become worthless.

Without some radical and speedy change by which the canals can be maintained irrespective of their revenues, and the carrier placed in a better position to cope with the railways, they will soon be without means to operate them, and without equipments to render them of service.

Respectfully submitted,

JOHN A. PLACE,

Auditor.

DOCUMENTS

ACCOMPANYING THE REPORT OF THE AUDITOR.

(No. 1.)

There was on deposit in sundry banks to the credit of the Treasurer of the State, on account of the canal fund, on the 30th September, 1880 (see page 44 of the last report), the sum of		\$2,286,145 82
And in the custody of the Auditor securities invested on account of the canal fund.....	\$1,032,700 00	
Real estate, etc., of the bank of Corning	3,799 00	
	<hr/>	1,036 499 00
		<hr/>
		\$3,322,644 82

Appropriations overdrawn, viz. :

The Erie and Champlain canals, for unexpended balances in hands of Adin Thayer, late Canal Commissioner.....	\$433 33	
S. B. Dutcher, Superintendent of Public Works.....	48 59	
	<hr/>	481 92
		<hr/>
		\$3,323,126 74
Deduct over payments, as above, included in accounts below		481 92
		<hr/>
		\$3,322,644 82

Received during the year ending 30th September, 1881, viz. :

Sinking fund for the redemption of the debt for the enlargement and completion of the canals, see No. 4....	\$972,746 65	
Fund for extraordinary repairs, see No. 8.....	23,118 98	
	<hr/>	
Carried forward.....	\$995,865 63	\$3,322,644 82

Brought forward	\$995,865 63	\$3,322,644 82
Fund for the enlargement of the Erie, the Oswego, etc., see No. 16.....	1,552 43	
Fund for the enlargement of the Champlain Canal, see No. 18..	7,374 36	
Fund for the reconstruction of the Oneida Lake canal, see No. 20, Erie and Champlain canals, see No. 26.....	780 70 790,809 74	
Oswego canal, see No. 28.....	13,745 16	
Cayuga and Seneca canal, see No. 30.....	1,095 27	
Black River canal, see No. 36....	12,052 47	
Oneida River improvement, see No. 42.....	454 66	
Seneca River towing-path, see No. 44.....	32 54	
Cayuga inlet, see No. 46	74 77	
		<hr/> 1,823,837 73
		<hr/> \$5,146,482 55

Paid during the same period, viz.:

Sinking fund for the redemption of the debt for the enlargement and completion of the canals, see No. 5.....	\$601,245 25.	
Fund for the enlargement and completion, see No. 17.....	7,421 60	
Erie Canal enlargement, see No. 25, Erie and Champlain canals, see No. 27.....	3,918 81 983,367 54	
Oswego canal, see No. 29.....	43,613 76	
Cayuga and Seneca canal, see No. 31.....	14,963 26	
Chemung canal, see No. 33.....	6,103 47	
Chenango canal, see No. 35	5,136 19	
Black River canal, see No. 37....	81,037 50	
Genesee Valley canal, see No. 39..	3,342 56	
Crooked Lake canal, see No. 41..	156 81	
Cayuga inlet, see No. 47.....	37 38	
		<hr/> 1,750,344 13

Leaving a balance on the 30th September, 1881, of.....	\$3,396,138 42
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Of the above balance there is on deposit in banks to the credit of the Treasurer of the State on ac- count of the canal fund, see No. 49.....	\$1,884,639 42
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Carried forward.....	\$1,884,639 42
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Brought forward.....	\$1,884,639.43
In the custody of the Auditor, securities invested on account of the canal fund, viz:	
United States bonds, 5's of 1881, continued.....	\$792,700 00
United States bonds, 4½'s, of 1891,	715,000 00
Real estate, etc., bank of Corning,	3,799 00
	<hr/> 1,511,499 00
	<hr/> \$3,396,138.43
Appropriations over drawn, viz. :	
Erie and Champlain canals, see No. 27.....	1,737 57
	<hr/> \$3,397,875 99
	<hr/>

Of the above amount there belongs to :

Sinking fund for the redemption of the canal debt, see No. 3.....	\$6,160 00
Sinking fund for the redemption of the debt for the enlargement and completion of the canals, see No. 5.....	2,416,821 57
Investment of premiums on loans, see No. 7.....	12,014 66
Fund for extraordinary repairs, see No. 9.....	583,745 02
Fund for the Albany basin, see No. 11.....	706 58
Taxes, 1866, see No. 13.....	269 30
Fund for the enlargement of the Erie, the Oswego, etc., see No. 17.....	140,058 64
Fund for the enlargement of the Champlain canal, see No. 19.....	205,071 35
Fund for the reconstruction of the Oneida Lake canal, see No. 21.....	26,804 03
Contractors' deposit fund, see No. 23.....	2,000 00
Fund of the Oswego canal, see No. 29.....	4,339 91
Fund of the Black River canal, see No. 37.....	824 93
	<hr/> \$3,397,875 99
	<hr/>

SINKING FUND FOR THE REDEMPTION OF THE CANAL DEBT.

(Under article 7, section 1 of the Constitution.)

(No. 2.)

Balance on hand 30th September, 1880.....	\$6,160 00
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(No. 3.)

Balance on hand 30th September, 1881.....	\$6,160 00
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SINKING FUND FOR THE REDEMPTION OF THE CANAL DEBT.

(Under article 7, section 3 of the Constitution.)

(No. 4.)

Balance on hand 30th September, 1880.....		\$2,045,320	17
Received, viz.:			
Tax of 1880.....		878,938	03
Interest on investments, viz.:			
On \$715,000 U. S. 4½'s, of 1891... ..	\$21,487	50	
On \$792,700 U. S. 5's, of 1881, contin'd, ..	40,829	44	
On temporary loan to Comptroller	2,033	83	
			64,350 77
Interest on deposits.....			16,422 89
Proceeds of sales of material, etc., of lateral canals, viz.:			
Chemung canal.....	\$2,266	52	
Chenango canal.....	1,862	63	
Genesee Valley canal.....	13,053	50	
	\$17,182	65	
Less expenses :			
Chemung canal.....	\$2,294	19	
Chenango canal.....	1,343	02	
Genesee Valley canal....	510	48	
		4,147	69
			13,034 96
			\$3,018,066 82

(No. 5.)

Paid, viz.: expenses of the transfer agency at New York, viz.:			
Arthur H. Masten, salary as transfer agent.....	\$406	25	
George S. Coleman, salary as transfer agent.....	343	75	
Nesbitt & Co., for stationery.....	62	00	
Bank of Manhattan Co., for keeping transfer office for the year ending 30th September, 1881	1,250	00	
			\$2,062 00
Premium on investments, viz.:			
On \$475,000 U. S. 4½'s, of 1891.....	\$55,218	75	
On \$5,000 N. Y. State canal loan, 6's, 1st January, 1883.....	362	50	
			55,581 25
Interest on loans.....			538,602 00
Cancellation of stock, 6's, 1st January, 1883.....			5,000 00
Carried forward.....			\$601,245 25

Brought forward.....	\$601,245 25
Balance on hand 30th September, 1881.....	2,416,821 57
	<hr/>
	\$3,018,066 82
	<hr/>

INVESTMENT OF PREMIUMS ON LOANS.

(Under chapter 329, Laws of 1854.)

(No. 6.)

Balance on hand 30th September, 1880.....	\$12,014 66
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(No. 7.)

Balance on hand 30th September, 1881.....	\$12,014 66
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FUND TO PROVIDE FOR EXTRAORDINARY REPAIRS.

(Under chapter 877, Laws of 1869 ; chapter 767, Laws of 1870 ; chapter 930, Laws of 1871 ; chapter 850, Laws of 1872 ; chapter 766, Laws of 1873 ; chapter 399, Laws of 1874 ; chapter 425, Laws of 1876 ; and chapter 270, Laws of 1878.)

(No. 8.)

Balance on hand 30th September, 1880.....	\$771,098 24
Received, viz. :	
Interest on deposits.....	23,118 98
	<hr/>
	\$794,217 22
	<hr/>

(No. 9.)

Paid, viz. :

Transferred to the fund of the Erie and Champlain canals for extraordinary repairs, see No. 26.....	\$5,829 75
Transferred to fund of the Erie and Champlain canals to supply deficiency in the revenues of the canals, in pursuance of section 2, chapter 449, Laws of 1881, see No. 26.....	205,642 45
	<hr/>
	\$211,472 20
Balance on hand 30th September, 1881.....	582,745 02
	<hr/>
	\$794,217 22
	<hr/>

FUND FOR THE ALBANY BASIN.

(Chapter 200, Laws of 1849.)

(No. 10.)

Balance on hand 30th September, 1880.....	\$706 58
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(No. 11.)

Balance on hand 30th September, 1881.....	\$706 58
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TAXES OF 1866.

(No. 12.)

Balance on hand 30th September, 1880.....	\$269 30
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(No. 13.)

Balance on hand 30th September, 1881.....	\$269 30
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TAXES OF 1880.

(No. 14.)

Received, viz. :

From the Comptroller, pursuant to act chapter 248 of the Laws of 1880, to provide for a deficiency in the sinking fund, under article 7, section 3 of the Constitution.....	\$878,938 03
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(No. 15.)

Transferred, viz. :

To the sinking fund for the redemption of the canal debt, under article 7, section 3, see No. 4.....	\$878,938 03
---	--------------

FUND FOR THE ENLARGEMENT OF THE ERIE, THE
OSWEGO AND CAYUGA AND SENECA CANALS, AND FOR
THE COMPLETION OF THE BLACK RIVER AND GENESEE
VALLEY CANALS, AND FOR OTHER PURPOSES.*(Article 7, section 3 of the Constitution, and chapter 329, Laws of 1854.)*

(No. 16.)

Balance on hand 30th September, 1880.....	\$169,760 06
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Carried forward.....	\$169,760 06
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Brought forward.....	\$169,760 06
Received, viz.:	
Interest on deposits.....	1,552 43
	<hr/>
	\$171,312 49
	<hr/>

(No. 17.)

Paid, viz.:

Transferred to sundry fund accounts for the payment of awards and interest thereon, viz.:	
Fund of the Erie canal enlargement, see No. 24	\$3,918 81
Fund of the Erie and Champlain canals, see No. 26.....	9,717 13
Fund of the Chenango canal, see No. 34..	791 15
Fund of the Black River canal, see No. 36.....	9,248 35
Fund of the Crooked Lake canal, see No. 40.....	156 81
	<hr/>
	\$23,832 25
Transferred to the account of the New York and Erie Bank, Buffalo, for amount of rebate allowed in settlement and compromise in pursuance of act chapter 497, Laws of 1880.....	7,421 60
	<hr/>

	\$31,253 85
Balance on hand 30th September, 1881.....	140,058 64
	<hr/>
	\$171,312 49
	<hr/>

FUND FOR THE ENLARGEMENT OF THE CHAMPLAIN CANAL

(Under chapter 788, Laws of 1870, chapter 399, Laws of 1874, chapter 185, Laws of 1876, and chapter 202, Laws of 1878.)

(No. 18.)

Balance on hand 30th September, 1880.....	\$284,549 56
Received, viz.:	
Interest on deposits and investment.....	7,374 36
	<hr/>
	\$291,923 92
	<hr/>

(No. 19.)

Paid, viz.:

Transferred to fund of the Erie and Champlain canals for improvement work on Champlain, see No. 26.....	\$86,852 57
Balance on hand 30th September, 1881.....	205,071 35
	<u>\$291,923 92</u>

FUND TO PROVIDE FOR THE RECONSTRUCTION OF THE
ONEIDA LAKE CANAL.

(No. 20.)

Balance on hand 30th September, 1880.....	\$26,023 33
Received, viz.:	
Interest on deposits.....	780 70
	<u>\$26,804 03</u>

(No. 21.)

Balance on hand 30th September, 1881.....	<u>\$26,804 03</u>
---	--------------------

DEPOSITS OF CONTRACTORS TO SECURE THE PERFORM-
ANCE OF CONTRACTS FOR NEW WORK AND EXTRAOR-
DINARY REPAIRS.

(Charter 930, Laws of 1871.)

(No. 22.)

Balance on hand 30th September, 1880.....	<u>\$2,000 00</u>
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(No. 23.)

Balance on hand 30th September, 1881.....	<u>\$2,000 00</u>
---	-------------------

FUND OF THE ERIE CANAL ENLARGEMENT.

(No. 24.)

Received, viz.:

Transferred from the fund for the enlargement and the completion, etc., see No. 17.....	<u>\$3,918 81</u>
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(No. 25.)

Paid, viz.:

B. S. W. Clark, Superintendent Public Works, for expenditures	\$150 00
S. B. Dutcher, Superintendent Public Works, for expenditures	3,420 55
For recording transcripts of awards	41 03
Interest on awards by the canal appraisers	307 23
	<hr/>
	\$3,918 81

ERIE AND CHAMPLAIN CANAL FUND.

(No. 26.)

Received, viz.:

Tolls on the Erie canal	\$746,081 85	
Tolls on the Champlain canal	37,241 45	
	<hr/>	\$783,323 30
Rent of surplus water		1,535 00
Errors in collectors' accounts		72
Of S. B. Dutcher, Superintendent of Public Works, for ice permits sold	\$1,743 50	
For sales old material	3 50	
	<hr/>	1,747 00
Of E. E. Carr, late collector at Rome, for sale of fixtures in late collector's office at Rome		15 00
Deposit of F. C. Smith to secure performance of contract, dated September 17, 1870, for constructing vertical wall on guard lock section at Black Rock, forfeited for non-performance of contract, amount certificate,	\$1,000 00	
Interest thereon	530 84	
	<hr/>	1,530 84
Deposit of Hugh M. Severance to secure performance of contract dated August 6, 1870, for raising and improving Sulphur Springs guard lock, forfeited for non-performance thereof, amount certificate	\$1,000 00	
Interest thereon	535 82	
	<hr/>	1,535 82
Carried forward		<hr/>
		\$789,687 68

Brought forward.....	\$789 687 68
Deposit of George C. Power, forfeited for non-performance of contract for constructing a wrought-iron bridge at Jefferson street, Schenectady.....	300 00
Of Ross & McLoud, for furniture in late collector's office at Montezuma.....	10 00
Proceeds of sale of old paper from late collector's office at Montezuma.....	14 00
From J. H. Chubb, late superintendent section 1, Champlain Canal, for balance of account.....	439 07
From T. W. Griffin, late superintendent section 1, Champlain Canal, for balance of account.....	23 43
Fees for recording mortgages.....	335 56

Balances in the hands of Canal Commissioner and Superintendent of Public Works, September 30, 1880, viz.:

Adin Thayer, Canal Commissioner,	\$433' 33	
S. B. Dutcher, Supt. Public Works,	48 59	
		481 92

Transferred from the following accounts, viz.:

Fund for the enlargement and completion, etc., see No. 17....	\$9,717 13	
Fund for extraordinary repairs, see No. 9.....	5,829 75	
Fund for the improvement of the Champlain, see No. 19.....	86,852 57	
		102,399 45

Transferred the following balances of surplus tolls of the lateral canals, viz.:

From the Oneida river improvement, see No. 43.....	\$454 66	
From the Seneca river towing path, see No. 45.....	32 54	
From the Cayuga inlet, see No. 47,	37 39	
		524 59

Transferred from the fund for extraordinary repairs, in pursuance of the second section of chapters 548 of the Laws of 1880, and 449 of the Laws of 1881, the deficiency of revenue to meet appropriation for collection and ordinary repairs, the deficiency being.....	205,642 45
--	------------

	\$1,099,858 15
Balances in the hands of late Canal Commissioner and Superintendent of Public Works.....	1,737 57
	<u>\$1,101,595 72</u>

(No. 27.)

Paid, viz.: for repairs, improvements, etc., to-wit:

Erie Canal.

For ordinary repairs, to S. B. Dutcher, Superintendent of Public Works.....	\$307,536 97	
To W. Scott Lasher, Division Engineer, Eastern Division.....	9,500 00	
To Marvin Porter, Division Engineer, Middle Division.....	12,000 00	
To Thomas Evershed, Division Engineer, Western Division...	8,500 00	
To section superintendents, including their salaries	310,454 78	
		\$647,991 75
To S. B. Dutcher, Superintendent of Public Works, for extraordinary repairs.....		5,829 75
To collectors of canal tolls, for salaries and expenses of their offices, viz.:		
W. T. O'Brien, New York	\$2,468 17	
Thomas Kimball, inspector, New York..	240 00	
	\$2,708 17	
David A. Bulson, Albany.....	3,208 53	
John H. Hulsapple, West Troy...	4,701 00	
Louis Faass, Utica.....	2,121 96	
Egbert E. Carr, Rome	821 69	
A. Von Landberg, Syracuse.....	2,307 88	
Frank Torrey, Montezuma.....	849 22	
Fred. W. Clemons, Palmyra.....	708 86	
Henry Hebing, Rochester.....	2,212 95	
Emil Schnitzer, Tonawanda.....	3,078 23	
Charles M. King, Buffalo.....	8,076 46	
		30,794 95
To weigh-masters, viz.:		
E. D. Weidman, Albany.....	\$508 40	
Lewis Taylor, West Troy	502 55	
Nathan L. Benson, West Troy...	581 10	
William Cahill, Syracuse.....	487 68	
James L. Hill, Syracuse.....	545 00	
James Gosnell, Rochester.....	1,171 08	
		3,795 76

Champlain Canal.

For ordinary repairs, to S. B. Dutcher, Supt. Public Works..	\$38,872 71	
To section superintendents, including their salaries.....	70,120 89	
Carried forward.....	\$108,993 60	\$688,412 21

Brought forward.....	\$108,993 60	\$688,412 21
To S. B. Dutcher, Supt. Public Works, for improvement work...	78,083 29	
For damages awarded by canal appraisers.....	4,476 27	
To W. Scott Lasher, Div. Engineer, for engineering expenses on improvement	6,322 77	
Interest on awards of canal appraisers	155 14	
To collectors of canal tolls :		
Thomas Preston, Waterford	\$1,821 11	
Wm. R. Ottman, Fort Edward.....	633 31	
James Doren, Whitehall,	1,911 15	
	<hr/>	
	4,365 57	
To Thomas Van Derkar, weigh-master at Waterford	1,052 59	
	<hr/>	
		203,449 23
For legal services in behalf of the State, before the Canal Appraisers and Canal Board, to the following attorneys, viz. :		
Dewitt C. Bouton.....	\$50 42	
P. McNamara	2,251 41	
D. S. Potter.....	1,778 50	
Samuel S. Edick.....	297 20	
Charles A. Hawley.....	708 19	
	<hr/>	
		5,085 72
Daniel A. Cooney, allowance by Canal Board.....		270 00
Horatio Seymour, Jr., State Engineer and Surveyor, for salary, one-quarter	\$1,250 00	
For travel, one year's allowance....	200 00	
	<hr/>	
		1,450 00
Department Superintendent Public Works :		
S. B. Dutcher, Supt. Public Works, for salary..	\$6,000 00	
For necessary traveling expenses.....	284 62	
	<hr/>	
	\$6,284 62	
For clerk hire and office expenses of Supt. and Assistant Supt. Public Works.....	11,893 20	
	<hr/>	
Carried forward.....	\$18,177 82	\$898,667 16

Brought forward.....	\$18,177 82	\$898,667 16
James Shanahan, Asst. Supt. Pub. Works, for salary	\$675 00	
For traveling expenses..	76 42	
	<hr/>	751 42
James D. Hancock, As- sist. Supt. Pub. Works, for salary	\$2,325 00	
For traveling expenses..	744 90	
	<hr/>	3,069 99
John Stebbins, Assistant Supt. Pub. Works, for salary	\$1,348 22	
For traveling expenses..	279 75	
	<hr/>	1,627 97
Wm. V. Van Rensselaer, Assistant Supt. Public Works, for salary.....	\$1,651 78	
For traveling expenses..	387 55	
	<hr/>	2,039 33
Henry L. Fish, Assistant Supt. Public Works, for salary.....	\$1,645 16	
For traveling expenses..	279 22	
	<hr/>	1,924 38
Ossian Bedell, Assistant Supt. Pub. Works, for salary	\$1,354 84	
For traveling expenses..	508 61	
	<hr/>	1,863 45
	<hr/>	<hr/>
		29,454 36

Canal Appraiser's Office.

For the compensation of the Canal Appraisers and their clerks, travel and miscellaneous expenses of office, Chap. 548, Laws 1881, viz.:

Wm. J. Morgan, for salary, travel and miscellaneous expenses of office	\$5,709 65	
Wm. L. Bostwick, for salary, travel, etc	5,483 03	
Charles M. Dennison, for salary, travel, etc.	5,317 24	
D. J. Apgar, Chief Clerk.....	3,500 00	
P. A. Hopkins, Clerk.....	2,208 36	
Robert Harris, Clerk	1,458 34	
Sundry accounts for stationery, etc..	278 46	
	<hr/>	23,955 08
Carried forward.....		<hr/>
		\$952,076 60

Brought forward.....

\$952,076 60

*Canal Department.*Salaries of the Auditor, Deputy Auditor, and clerks
of the Canal Department, Chap. 548, Laws 1880:

John A. Place, Auditor.....	\$5,000 00
Edmund Savage, Deputy Auditor and accountant.....	3,500 00
George H. Birchall, asst. accountant,	1,800 00
Thomas W. Jaycox.....	1,738 75
George W. Slingerland	1,350 00
Daniel Cooney.....	600 00
L. H. Hackett.....	976 67
Charles R. Allen.....	1,458 34
H. J. McDonald.....	1,200 00
C. D. Austin.....	1,200 00

- 18,823 76

For printing blanks, for collectors, superintendents,
and other officials, viz.:

To Argus Company.....	\$1,279 02
To Weed, Parsons & Co.....	2,831 98

4,111 00

1,217 09

To sundry persons for toll refunded.....

D. M. and J. C. Monty, an allowance by the Board
of Audit, made March 30, 1881, in pursuance of
chapter 475, of the Laws of 1881 ..

2,446 51

Fort Miller Bridge Co. for use of towing path bridge
across Hudson river, at Saratoga dam, annual
payment

1,000 00

American Express Company, for transportation....

111 80

National Express Company, for transportation....

42 80

Edwin Ellis & Co., for stationery, etc.....

45 38

Sundry persons, for stationery, etc.....

19 10

T. L. Goodwin, for stationery, etc.....

50 60

Comptroller, for stationery, etc.....

25 97

Freight on boxes of books and accounts from late
collector's office at Montezuma.....

6 00

Carlisle & Hill, taking down, repairing and putting
up stoves.....

25 91

Alonzo P. Strong, attorney for Homer Rexford,
royalty on 305 lock-gate steps, approved by com-
missioners of the canal fund, October, 18, 1880..

1,220 00

For postage stamps, drawer rent, etc.....

330 70

J. W. Lyon & Co., for National Atlas

18 00

R. G. Dun & Co., subscription to mercantile agency
to March 1, 1882, one year.....

150 00

Mrs. Poole, for washing towels.....

24 00

Subscriptions to sundry newspapers

42 20

Carried forward.....

\$981,787 42

Brought forward.....	\$981,787 42
Auditor's expenses to and from Tonawanda, investigating charges preferred against collector, per direction of canal board.....	15 80
Robert K. Oliver, for packing boxes for collectors and weigh-master's blanks.....	26 77
W. H. Slade, for tax-searches, appraisal of lands, etc., received from late Pratt Bank, Buffalo.....	192 00
For draping rooms of the canal department, on death President James A. Garfield.....	20 63
Toll refunded.....	4 87
Repairing office furniture, etc.....	17 55
Atlantic and Pacific Telegraph Co., accounts.....	20 97
Western Union Telegraph Co., accounts.....	25 88

Appropriations overdrawn September 30, 1880:

Balance in hands of Adin Thayer, late canal commissioner.....	\$433 33	
Balance in hands of S. B. Dutcher, Superintendent Public Works,	48 59	
		481 92

Transferred to sundry fund accounts, to supply deficiencies of the lateral canals, to pay repairs, etc., viz.:

Oswego canal, see No. 28.....	\$29,868 60	
Cayuga and Seneca canal, see No. 30.....	13,867 99	
Chenango canal, see No. 34.....	4,345 04	
Chemung canal, see No. 32.....	6,103 47	
Genesee Valley canal, see No. 38 ¹	3,342 56	
Black River canal, see No. 36.....	59,736 68	
		117,264 34

To Adin Thayer, late canal commissioner, for balance in his hands, September 30, 1881.....	433 33
To S. B. Dutcher, Superintendent of Public Works, for balance in his hands, September 30, 1881.....	1,304 24

\$1,101,595 72

OSWEGO CANAL FUND.

(No. 28.)

Balance on hand September 30, 1880.....	\$4,399 91
Received, viz.:	
From tolls.....	13,650 59
From Willard Johnson, for tolls on timber, rafted in 1878.....	56 00
Carried forward.....	\$18,106 50
[Assem. Doc. No. 4.]	6

Brought forward.....	\$18,106 50
From T. R. Wright, for tolls on timber rafted in 1879	38 57

Transferred :

Deficiency from tolls of the Erie and Champlain canals, see No. 27	29,868 60
	<u>\$48,013 67</u>

(No. 29.)

Paid, viz. :

William S. Turner, collector of tolls at Oswego.....	\$2,905 27
To section superintendents for ordinary repairs and salaries, viz. :	
Dewitt C. Toll, section 1.....	\$10,205 89
O. J. Jennings, section 2.....	14,540 59
	<u>24,746 48</u>
S. B. Dutcher, Superintendent Public Works, for ordinary repairs.....	15,962 01
	<u>\$43,613 76</u>
Balance on hand September 30, 1881	4,399 91
	<u>\$48,013 67</u>

CAYUGA AND SENECA CANAL FUND.

(No. 30.)

Received, viz. :

Tolls.....	\$1,095 27
Transferred :	
Deficiency from the tolls of the Erie and Champlain canals, see No. 27.....	13,867 99
	<u>\$14,963 26</u>

(No. 31.)

Paid, viz. :

Abraham Robison, collector of canal tolls at Geneva,	\$1,077 71
For ordinary repairs :	
S. B. Dutcher, Superintendent Public Works.....	\$8,033 82
N. J. Latham, section superin- tendent.....	5,851 73
	<u>13,885 55</u>
	<u>\$14,963 26</u>

CHEMUNG CANAL FUND.

(No. 32.)

Received, viz., transferred :

Deficiency from the tolls of the Erie and Champlain canals, see No. 27	\$6,103 47
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(No. 33.)

Paid, viz. :

S. B. Dutcher, Superintendent Public Works, for ordinary repairs.....	\$6,103 47
--	------------

CHENANGO CANAL FUND.

(No. 34.)

Received, viz., transferred from the following accounts, viz. :

Fund for the enlargement and completion, etc., see No. 17.....	\$791 15
Deficiency from the tolls of the Erie and Champlain canals, see No. 27.....	4,345 04
	<hr/> \$5,136 19 <hr/>

(No. 35.)

Paid, viz., for ordinary repairs :

S. B. Dutcher, Superintendent Public Works.....	\$3,217 77	
T. W. W. Washburn, section super- intendent, including salary....	1,127 27	\$4,345 04
S. B. Dutcher, Superintendent Public Works, for damages awarded by canal appraisers.....		771 50
Interest on awards of canal appraisers.....		19 65
		<hr/> \$5,136 19 <hr/>

BLACK RIVER CANAL FUND.

(No. 36.)

Balance on hand September 30, 1880.....	\$824 93
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Received, viz. :

Tolls.....	12,042 47
Carried forward.....	<hr/> \$12,867 40

Brought forward.....	\$12,867 40
For fine imposed by S. M. Ferguson, superintendent, and collected of Asaph Leonard and Fred. Johnson,	10 00
Transferred from the following accounts, viz. :	
Fund for the enlargement and completion, etc., see No. 17.....	9,248 35
Deficiency from the tolls of the Erie and Champlain canals, see No. 27.....	59,736 68
	<hr/>
	\$81,862 43

(No. 37.)

Paid, viz. :	
Leander W. Fiske, collector of tolls at Boonville....	\$905 41
S. B. Dutcher, Superintendent Public Works, for ordinary re- pairs.....	\$45,640 24
S. M. Ferguson, section superin- tendent, for ordinary repairs and salary.....	25,243 50
	<hr/>
	70,883 74
S. B. Dutcher, Superintendent of Public Works, awards by Canal Appraisers for damages.....	8,969 67
Interest on awards of Canal Appraisers.....	278 68
	<hr/>
	\$81,037 50
Balance on hand September 30, 1881.....	824 93
	<hr/>
	\$81,862 43

GENESEE VALLEY CANAL FUND.

(No. 38.)

Received, viz. :	
Transferred deficiency from the tolls of the Erie and Champlain canals, see No. 27.....	\$3,342 56

(No. 39.)

Paid, viz. :	
Wm. Napier, section superintendent, for ordinary repairs and salary.....	\$3,342 56

FUND OF THE CROOKED LAKE CANAL.

(No. 40.)

Received, viz.:	
Transferred from the fund for the enlargement and completion, etc., see No. 17.....	\$156 81

(No. 41.)

Paid, viz.:

S. B. Dutcher, Superintendent of Public Works, for damages awarded by the Canal Appraisers	\$150 00
Interest on awards of the Canal Appraisers	6 81
	<hr/>
	\$156 81
	<hr/>

FUND OF THE ONEIDA RIVER IMPROVEMENT.

(No. 42.)

Received, viz.:

Tolls	\$313 11
From Willard Johnson, for tolls on timber rafted in 1878	93 33
From T. R. Wright, for tolls on timber rafted in 1879	48 22
	<hr/>
	\$454 66
	<hr/>

(No. 43.)

Paid, viz.:

Transferred to fund of Erie and Champlain canals, the surplus tolls, see No. 26	\$454 66
	<hr/>

FUND OF THE SENECA RIVER TOWING-PATH.

(No. 44.)

Received, viz.:

Tolls	\$32 54
	<hr/>

(No. 45.)

Paid, viz.:

Transferred to fund of Erie and Champlain canals, the surplus tolls, see No. 26	\$32 54
	<hr/>

FUND OF THE CAYUGA INLET.

(No. 46.)

Received, viz.:

Tolls	\$74 77
	<hr/>

(No. 47.)

Paid, viz.:

To the Treasury, under act, chapter 25 of the Laws of 1847	\$37 38
Transferred to fund of the Erie and Champlain canals, the surplus tolls, see No. 26	37 39
	<hr/>
	\$74 77
	<hr/>

CANAL DEBT.

(No. 48.)

(Under article 7, section 1 of the Constitution.)

Erie and Champlain canals :

Stock not bearing interest.....	\$160 00
Redeemable as follows, viz.:	
Six per cent, July 1, 1837.....	\$160 00

To supply deficiency :

Stock not bearing interest.....	6,000 00
Redeemable as follows, viz.:	
Five per cent, January 1, 1874...	\$6,000 00

Total canal debt, under article 7, section 1 of the Constitution, paying no interest.....	\$6,160 00
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(Under article 7, section 3 of the Constitution.)

For payment of canal revenue certificates :

Stock not bearing interest.....	\$500 00
Redeemable as follows, viz.:	
Six per cent, July 1, 1873.....	\$500 00

To supply deficiencies :

Stock bearing six per cent interest	8,976,700 00
Redeemable as follows, viz.:	
Six per cent, 1st January, 1883 ..	\$638,200 00
Six per cent, 1st July, 1887.....	1,562,900 00
Six per cent, 1st July, 1891, July loan.....	2,328,000 00
Six per cent, 1st July, 1891, November loan.....	1,974,600 00
Six per cent, 1st October, 1892...	2,000,000 00
Six per cent, 1st October, 1893...	473,000 00
	\$8,976,700 00

Total canal debt under section 3.....	\$8,977,200 00
Of which there pays no interest.....	500 00

Total canal debt under section 3, paying interest...	\$8,976,700 00
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RECAPITULATION OF THE FOREGOING STATEMENT OF THE CANAL DEBT PAYING INTEREST ON THE 30TH SEPTEMBER, 1881.

Under article 7, section 3 of the Constitution.....	\$8,976,700 00
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STATEMENT of the canal debt 30th September, 1881, showing each description of stock, the amount redeemable in each year, and the annual interest on the same.

WHEN DUE.	Five per cent.	Six per cent.	Total.
1837.....		\$180 00	\$180 00
1873.....		500 00	500 00
1874.....	\$5,000 00		6,000 00
Pays no interest.....	\$5,000 00	\$500 00	\$5,500 00
1883.....		\$538,200 00	\$538,200 00
1887.....		1,562,800 00	1,562,800 00
1891.....		4,302,600 00	4,302,600 00
1892.....		2,000,000 00	2,000,000 00
1893.....		473,000 00	473,000 00
Debt paying interest.....		\$8,976,700 00	\$8,976,700 00
Debt not paying interest.....	\$5,000 00	500 00	5,500 00
Total debt.....	\$5,000 00	\$8,977,200 00	\$8,982,200 00
Annual interest.....		\$538,602 00	\$538,602 00

AN ANALYSIS OF THE FOREGOING TABLE.

	Principal of debt and sections of article 7 of the Constitution.	Annual interest of the debt.
Section 3, 6s.....	\$8,976,700 00	\$538,602 00

The interest on the debt is six per cent.

Of the above debt paying interest there was held on the 30th September, 1881:

On the United States account.....	\$8,019,900 00
On foreign account.....	956,800 00
	<u>\$8,976,700 00</u>

(No. 49.)

STATEMENT showing the balance on hand September 30, 1881, how deposited and invested, together with the names of the accounts to which it belongs.

DEPOSITED.

Names of Banks.	Amounts.
Albany City National Bank.....	\$133,417 82
Bank of Attica, Buffalo.....	94,170 36
Bank of Buffalo.....	94,164 85
Bank of Commerce, Buffalo.....	94,186 54
Bank of Monroe, Rochester.....	2,000 00
Central National Bank, Rome.....	8,337 52
Evans, Schwinger & Co., Tonawanda.....	75,462 15
Farmers and Mechanics' National Bank, Buffalo...	94,059 92
First National Bank, Albany.....	133,427 69

Names of Banks.	Amounts.
First National Bank, Boonville.....	\$9,901 23
First National Bank, Buffalo.....	83,998 46
First National Bank, Oswego.....	50,658 28
First National Bank, Rome.....	2,072 93
First National Bank, Utica.....	1,725 63
Flour City National Bank, Rochester.....	1,391 72
Fort Stanwix National Bank, Rome.....	7,299 13
German Bank, Buffalo.....	73,847 41
Manhattan Co., New York.....	11,700 99
Manufacturers and Traders' Bank, Buffalo.....	94,167 03
Marine Bank, Buffalo.....	73,862 43
Merchants' Bank, Buffalo.....	18,718 00
Merchants' National Bank, Albany.....	133,472 42
Merchants' National Bank, Whitehall.....	6,393 96
Mutual National Bank, Troy.....	138,689 86
New York State Banking Company, Syracuse.....	30,034 34
New York State National Bank, Albany.....	133,416 17
Old National Bank, Whitehall.....	36,705 93
Robert Gere Bank, Syracuse.....	2,142 81
Saratoga County Bank, Waterford.....	5,974 39
Second National Bank, Oswego.....	8,484 59
Third National Bank, Buffalo.....	157 35
Utica City National Bank.....	10,402 10
White's Bank, Buffalo.....	94,103 28
Wilkinson & Co., Syracuse.....	30,052 39
Available.....	<hr/> \$1,788,601 68 <hr/>
Atlantic National Bank, New York.....	\$1,598 66
Bank of Corning.....	11,135 63
Bank of Hornellsville.....	9,554 11
Canal Bank, Lockport.....	7,231 20
Central City Bank, Syracuse.....	10,674 08
Farmers and Mechanics' Bank, Rochester.....	20,518 57
J. T. Raplees Bank, Penn Yan.....	1,689 07
Lockport Bank and Trust Company.....	8,845 00
Medina Bank.....	4,469 88
Oliver Lee & Co.'s Bank, Buffalo.....	12,777 73
Pratt Bank, Buffalo.....	7,543 81
Unavailable.....	<hr/> \$96,037 74 <hr/>
Amount deposited in banks, available.....	\$1,788,601 68
Amount deposited in banks, unavailable.....	96,037 74
Total amount deposited.....	<hr/> \$1,884,639 42 <hr/>

TABLES.

7

(No. 50.)

STATEMENT of the amount of canal stocks purchased and canceled during fiscal year, ending September 30, 1881.

Date of purchase	Of whom purchased.	Description of stock.	Amount of stock.	Premium.	Total paid.
1880, November 24	State Bank, Fort Edward...	Def. 6s, Jan. 1, 1883	\$5,000 00	\$362 50	\$5,362 50

(No. 51.)

STATEMENT of the operation of the Sinking Fund for the Canal Debt, under Article 7, Section 1 of the Constitution.

YEARS.	RECEIVED.							Total.	
	Loans to sup- ply deficien- cies.	Premiums on loans.	Proceeds of taxes.	From tolls.	Interest on de- posits and in- vestments, and discount on stocks pur- chased.	Reimburse- ment of temporary investments, in taxes to be levied and in- terest there- on.	Sale of stock investments.		Miscellaneous.
1846.....	\$438,338 33	.....	.....	.....	.....	\$438,338 33
1847.....	1,300,000 00	.....	.....	.....	.....	1,300,000 00
1848.....	\$253,000 00	\$16,838 94	\$119,410 30	1,300,000 00	\$1,899 71	.....	.....	.....	2,203,168 95
1849.....	1,730,024 76	.....	.....	1,300,000 00	7,774 28	.....	.....	.....	8,047,559 04
1850.....	215,610 76	.....	1,300,000 00	.....	.....	.....	.....	1,558,490 69
1851.....	1,300,000 00	.....	.....	.....	.....	1,300,000 00
1852.....	1,300,000 00	3,250 00	.....	.....	.....	1,303,250 00
1853.....	1,300,000 00	28,335 79	.....	.....	.....	1,327,335 79
1854.....	1,300,000 00	10,000 00	.....	.....	.....	1,310,000 00
1855.....	1,300,000 00	28,000 00	.....	.....	.....	1,328,000 00
1856.....	4,000,000 00	.....	.....	1,700,000 00	14,000 00	.....	.....	.....	1,917,145 56
1857.....	28,427 73	.....	1,700,000 00	84,714 11	.....	.....	.....	1,829,000 00
1858.....	1,500,000 00	24,300 00	40,500 00	963,235 97	65,614 74	.....	\$191,938 00	1,989 54	6,714,000 00
1859.....	47,000 00	962,000 00	18,705 23	.....	.....	112 65	2,745,561 39
1860.....	1,699,611 61	86,258 18	835,663 75	.....	.....	1,027,705 94
1861.....	1,200,000 00	16,838 50	.....	1,700,000 00	82,940 48	.....	.....	.....	2,941,533 54
1862.....	1,700,000 00	64,000 00	.....	.....	.....	9,931,532 96
1863.....	1,700,000 00	68,297 00	.....	.....	.....	1,732,042 24
1864.....	1,700,000 00	68,323 25	.....	.....	.....	1,738,113 73
1865.....	1,660,691 86	69,432 25	.....	.....	.....	1,769,065 79
1866.....	1,700,000 00	59,992 22	.....	.....	.....	1,769,065 79
1867.....	1,700,000 00	75,471 25	.....	.....	.....	2,227,062 22
1868.....	1,700,000 00	73,173 43	.....	.....	.....	2,269,471 25
1869.....	1,700,000 00	69,513 00	.....	.....	.....	2,236,173 43
1870.....	59,513 00	1,034,500 00	.....	.....	1,094,013 00
1871.....	53,803 75	.....	.....	.....	89,843 75
1872.....	14,090 99	.....	.....	.....	589,030 99
1873.....	13,541 92	.....	.....	.....	304,008 69
1874.....	25,473 71	.....	.....	.....	513,803 71
1875.....	10,863 40	.....	.....	.....	205,868 40
1876, 1877, 1878, 1879. 1880, 1881.....
Total.....	\$9,294,024 76	\$302,080 93	\$401,910 30	\$32,597,379 04	\$898,527 77	\$6,070,731 73	\$121,938 00	\$45,723 53	\$49,682,385 04

STATEMENT No. 51 — (Continued.)

YEARS.	PAID.										Total.	
	Principal of debt.	Interest on debt.	Claims prior to 1st June, 1846.	Premium on stocks pur- chased.	Accrued interest on stocks pur- chased.	Temporary in- vestments in taxes to be col- lected.	Investments in stocks.	Certificates, plates and agency in New York.	Premium on coin purchased to pay interest.	General fund for deferred contri- butions, under art. 7, sec. 2 of the Constitution and thereon.		Miscellaneous.
1846.	\$483,333 33											\$483,333 33
1847.	206,256 00	\$37,205 64		\$5,131 40				\$2,116 00				1,149,700 04
1848.	1,341,489 00	911,736 05		8,820 25	\$9 21			453 00				2,250,515 51
1849.	2,067,329 00	898,569 05			2,101 38			2,597 00				3,000,696 43
1850.	482,786 61	861,311 00	\$84,715 53		1,638 34			2,185 00				1,428,534 50
1851.	573,609 91	822,435 38	\$4,820 53					2,257 50				1,433,309 37
1852.	840,255 45	801,161 04			278 53			2,170 75				1,143,875 53
1853.		801,161 00				\$621,467 47		2,087 50				1,24,715 87
1854.	479,025 00	782,911 00						2,229 66				1,285,102 52
1855.	1,111,911 00	750,669 07	10,988 86					2,411 05				1,890,164 15
1856.	4,118,364 31	692,193 28	25,177 37					2,904 13				4,825,481 12
1857.	2,102,393 00	692,193 28	22,877 61		297 95		\$72,838 00	2,301 63			\$338 35	4,902,153 79
1858.	2,926,767 34	672,110 72	217 39		82 23		49,000 00	2,388 00			4,150 28	8,655,117 40
1859.	900,323 00	604,263 04	180 00			600,000 00		2,381 25				1,703,338 75
1860.	2,175,351 23	598,675 36				800,000 00		2,412 00				3,655,117 40
1861.	820,000 00	517,230 08	230 00	23 49		559,724 77		2,512 00			156 31	1,703,338 75
1862.	431,300 00	457,396 48	11 01	8,891 25	3,212 08	9,238 27		2,184 00	\$80,715 53		406 77	1,969,439 94
1863.	457,700 00	457,105 98	50 00	8,308 50	3,363 60	9,238 27		2,807 25	31,418 47			1,041,501 02
1864.	2,644,374 76	325,465 61			1,617 42	450,000 00		2,191 60		\$600,000 00		4,031,954 79
1865.	415,750 00	251,565 00		500 00	7,698 61	600,000 00		2,238 00		782,861 04		2,053,091 96
1866.	1,662,000 00	204,427 50			8,423 35	510,000 00		2,238 00		863,125 00	140 00	2,755,094 11
1867.	1,017,300 00	138,778 75		1,856 46	5,629 56	1,000,000 00		2,249 50				2,163,108 09
1868.	1,111,200 00	90,490 25		6,028 75		34,000 00		2,108 00				1,244,406 56
1869.	23,000 00	53,996 00		800 00		600,000 00		2,163 50	5,159 94			586,516 44
1870.		55,321 00				737,500 00		2,274 19	6,801 66			64,396 85
1871.		55,321 00						2,154 18	6,822 00			800,757 18
1872.		55,321 00						1,750 00	8,035 89			64,106 89
1873.		13,930 23						8,707 50	115,898 18			1,231,085 33
1874.	1,068,250 00											2,170 00
1875.	2,170 00											

(No. 52.)

STATEMENT of the operation of the Sinking Fund for the Canal Debt, under article 7, section 3 of the Constitution.

YEARS.	Loans to supply deficiencies.	Premiums on loans.	Proceeds of taxes.	From tolls.	Interest on deposits and investments, and discount on stock purchased.	Miscellaneous	Total.
1854	\$94,861 72	.....	.....	\$94,861 72
1855	\$3,809 00	.....	3,809 00
1856	8,420 02	.....	8,420 02
1857	4,420 32	.....	4,420 32
1858	4,418 84	.....	4,418 84
1859	4,629 25	.....	4,629 25
1860	4,900 75	.....	4,900 75
1861	6,103 79	.....	6,103 79
1862	41,088 77	41,088 77
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
Total.	\$11,886,000 00	\$154,045 83	\$3,800,476 38	\$11,154,509 96	\$685,994 19	\$488,749 02	\$33,219,774 38

* Transferred from the fund for extraordinary repairs, pursuant to section 7 of chapter 425 of the Laws of 1870. The money was originally appropriated from the proceeds of taxes for extraordinary repairs.

† Transferred from Sinking Funds under article 7, sections 1 and 12 of the Constitution, pursuant to act chapter 160 of the Laws of 1876, being the surplus of those funds.

STATEMENT No. 52 — (Continued.)

YEARS.	PAID.						Total.	
	Principal of debt.	Interest on debt.	Premium on stocks purchased.	Accrued interest on stocks purchased.	Interest on temporary advances.	Premium on coin purchased to pay interest.		Miscellaneous
1854	.....	\$18,691 23	.....	.....	.....	.....	.....	\$18,691 23
1855	.....	211,274 82	.....	.....	.....	.....	.....	211,274 82
1856	.....	477,484 11	.....	.....	.....	.....	.....	477,484 11
1857	.....	644,914 37	.....	.....	.....	.....	.....	644,914 37
1858	.....	706,250 80	.....	.....	.....	.....	.....	706,250 80
1859	.....	710,000 00	.....	.....	.....	.....	.....	710,000 00
1860	.....	728,000 00	.....	.....	.....	.....	.....	728,000 00
1861	.....	728,000 00	\$138 13	\$745 35	\$40,614 02	.....	\$481 28	729,045 81
1862	\$1,300,000 00	728,000 00	.....	.....	.....	.....	182 63	1,998,000 00
1863	60,000 00	710,000 00	6,982 50	298 75	.....	\$117,593 75	.....	863,886 00
1864	204,000 00	704,450 00	22,737 50	1,038 50	.....	10,765 85	.....	863,886 00
1865	69,000 00	694,213 50	8,990 00	1,038 47	.....	.....	.....	772,380 97
1866	100,000 00	690,850 00	.....	249 43	.....	.....	.....	791,089 43
1867	782,000 00	687,975 00	.....	3,211 44	.....	.....	.....	1,453,186 44
1868	450,900 00	680,057 50	2,254 50	.....	.....	.....	.....	1,083,312 00
1869	602,900 00	611,715 00	15,010 30	53 17	.....	.....	.....	1,132,678 47
1870	536,200 00	573,186 00	29,551 00	.....	.....	51,298 67	.....	1,190,253 67
1871	.....	557,100 00	.....	.....	.....	67,412 87	.....	624,502 87
1872	1,491,800 00	583,650 50	.....	.....	.....	60,195 56	2,739 99	2,078,382 06
1873	3,145,000 00	622,583 50	.....	.....	.....	62,898 24	227,306 98	8,957,897 97
1874	2,025,800 00	627,189 84	.....	.....	.....	40,404 96	106,631 17	2,708,024 97
1875	2,141,800 00	651,690 39	.....	.....	.....	83,029 99	7,570 95	2,708,461 28
1876	478,000 00	651,160 00	.....	.....	.....	65,928 90	8,150 47	1,096,238 67
1877	181,000 00	648,036 89	25,845 00	.....	.....	31,173 95	2,125 75	786,431 59
1878	.....	640,822 00	.....	.....	.....	8,109 54	2,114 50	551,046 04
1879	32,000 00	640,822 00	- 5,622 50	.....	.....	.....	2,106 60	580,551 00
1880	.....	533,962 00	10,450 00	.....	.....	.....	2,075 00	551,427 00
1881	5,000 00	538,662 00	55,681 25	.....	.....	.....	2,068 00	601,245 25
Total	\$13,408,500 00	\$16,207,035 45	\$183,523 68	\$5,715 10	\$40,614 02	\$598,759 28	\$358,446 28	\$30,803,962 51
Balance on hand 30th September, 1881.....								
2,416,821 57								
\$33,219,774 88								

(No. 53.)

STATEMENT of the operation of the Sinking Fund for the Canal Debt, under Article 7, Section 12 of the Constitution.

YEARS.	RECEIVED.				PAID.								Total.
	Proceeds of taxes.	Interest on deposits and investments	Temporary loan to pay interest and investments in taxes	Total.	Principal of debt.	Interest on debt.	Premium on stocks purchased.	Accrued interest on stocks purchased.	Temporary loan.	Temporary investment in taxes to be collected.	Premium on coin purchased and interest.	Stock debt under article 7, section 10, of the Constitution.	
1890.	\$350,000 00	.....	\$187,500 00	\$187,500 00	.....	\$112,500 00	.....	.....	\$187,500	.....	.....	.....	\$112,500 00
1891.	475,905 60	\$18,045 60	.....	493,951 20	.....	150,000 00	.....	\$528 68	.....	.....	.....	.....	493,951 20
1892.	385,040 92	5,764 58	.....	390,805 50	.....	150,000 00	.....	1,283 03	.....	.....	.....	.....	390,805 50
1893.	585,373 94	24,101 64	.....	609,475 58	\$242,000	135,255 00	.....	1,197 43	.....	.....	.....	.....	609,475 58
1894.	585,373 94	15,000	.....	599,373 94	41,000	132,735 00	.....	419 69	.....	.....	.....	.....	599,373 94
1895.	367,744 97	18,968 58	.....	386,713 55	459,000	123,765 00	.....	1,963 75	.....	.....	.....	.....	386,713 55
1896.	279,965 62	35,067 56	.....	315,033 18	459,000	123,765 00	.....	419 69	.....	.....	.....	.....	315,033 18
1897.	187,575 63	20,676 12	.....	208,251 75	43,000	102,000 00	.....	316 50	.....	.....	.....	.....	208,251 75
1898.	203,853 20	21,291 26	.....	225,144 46	15,000	101,325 00	.....	75 00	.....	\$350,000 00	.....	.....	225,144 46
1899.	184,171 40	13,601 53	.....	197,772 93	15,000	100,650 00	.....	.....	.....	.....	.....	.....	197,772 93
1870.	227,864 79	28,813 21	.....	256,678 00	39,000	95,670 00	.....	2,205 00	.....	.....	.....	.....	256,678 00
1871.	240,957 65	2,186 88	.....	484,394 53	.....	94,500 00	.....	.....	.....	825,000 00	.....	.....	484,394 53
1872.	251,485 90	2,789 06	.....	429,774 96	651,000	84,075 00	.....	.....	.....	170,000 00	.....	.....	429,774 96
1873.	280,571 15	9,929 49	.....	492,630 64	44,000	52,800 00	.....	.....	.....	116,500 00	.....	.....	492,630 64
1874.	280,571 23	7,619 67	.....	603,994 57	.....	52,800 00	.....	.....	.....	315,909 13	.....	.....	603,994 57
1875.	280,571 23	13,139 45	.....	626,270 68	.....	52,800 00	.....	.....	.....	835,900 00	.....	.....	626,270 68
1876.	280,053 06	23,360 57	.....	303,413 63	.....	52,800 00	.....	.....	.....	.....	.....	.....	303,413 63
1877.	.....	.....	.....	323,367 50	.....	52,800 00	.....	.....	.....	.....	.....	.....	323,367 50
1878.	.....	.....	.....	.....	880,000	8,824 11	.....	.....	.....	.....	.....	.....	880,000
1879.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880, 1881.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.	\$4,722,984 49	\$270,889 43	\$1,875,883 67	\$6,905,757 59	\$2,500,000	\$2,804,684 11	\$110,028 91	\$5,743 30	\$187,500	\$1,612,909 13	\$305,561 07	\$484,121 07	\$6,905,757 59

*Surplus of the fund transferred to Sinking Fund under article 7, section 3, in pursuance of act chapter 150 of the Laws of 1878.

(No. 54.)
STATEMENT showing the amount of taxes paid into the treasury, for account of the Canal Fund under the present Constitution.

YEARS.	For redemption of Cayuga and Seneca canal stock.	For sinking fund under article 7, section 1.	For sinking fund under article 7, section 3.	For sinking fund under article 7, section 12.	For General Fund Debt Sinking Fund.	For dam's prior to 1st June, 1846, and sundry objects and works.	For enlargement and completion of the canal, section 3.	For improvement of the Champlain plain canal.	For extension of the Chenango canal.	For improvement of the Genesee Valley canal.	Total.
1846	\$26,503 47	\$119,410 30				\$24,457 47					\$54,508 47
1847					\$57,500 00						119,410 30
1848			\$232,500 00		232,500 00						621,467 47
1849		40,500 00									320,000 00
1850		47,000 00									292,500 00
1851			680,000 00				\$1,200,000 00				1,240,500 00
1852							1,089,515 70				890,567 06
1853							1,490,552 28				1,069,515 70
1854							719,674 88				840,552 28
1855							886,614 17				2,780,623 09
1856											1,090,198 45
1857											835,473 24
1858											831,770 20
1859											2,141,613 82
1860											1,408,847 83
1861											1,019,256 98
1862											1,595,035 93
1863											3,890,085 93
1864											2,645,817 04
1865											3,557,237 08
1866											2,557,819 04
1867											712,819 98
1868											900,206 50
1869											805,083 81
1870											789,724 90
1871											878,938 08
1872											
1873											
1874											
1875											
1876											
1877											
1878											
1879											
1880											
1881											
Total	\$54,503 47	\$672,777 26	\$8,244,877 03	\$4,759,044 49	\$350,000 00	\$621,407 47	\$19,000,042 46	\$1,867,969 53	\$1,800,104 00	\$358,938 24	\$27,910,443 42

(No. 55.)

STATEMENT of the amount of tolls received on all the canals, etc., the amount paid to the collectors during the fiscal year ending 30th September, 1881, together with the net amount received in the fiscal years of 1880 and 1881.

CANALS.		Tolls, 1881.	Collectors.	Net, 1881.	Net, 1880.
Erie.....		\$746,061 85	\$30,794 95	\$715,266 90	\$1,068,250 19
Champlain		37,241 45	4,365 57	32,875 88	45,186 40
Total Erie and Champlain canals					
Oswego		\$783,323 30	\$35,160 52	\$748,162 78	\$1,114,116 59
Cayuga and Seneca		13,450 50	2,005 27	10,745 23	11,807 07
Black River		1,005 27	1,077 71	17 56	249 83
Genesee Valley		12,042 47	905 41	11,137 06	10,652 02
Seneca River improvement.....		318 11	.....	318 11	438 90
Seneca River towing-path.....		32 54	.....	32 54	269 72
Cayuga Inlet.....		74 77	.....	74 77	31 87
Total.....		\$910,532 05	\$40,048 91	\$870,483 14	\$1,187,065 72

* Deficiency.

(No. 56.)

STATEMENT showing: 1. The amount of tolls (including rents from surplus waters) collected in each fiscal year, from 1826 to 1881. 2. Total sum paid to collectors, inspectors and weighmasters, and the expenses of their offices. 3. The percentage of the cost of collection on the gross amount of tolls collected. 4. The year in which the collection of tolls commenced on each lateral canal.

YEARS.	1. Tolls.	2. Cost of collection.	3. Per cent.	4. Names of canals.
1826	\$844,508 02	...	.....	Cayuga and Seneca.
1827	881,134 00	\$27,686 61	3.00	
1828	881,002 10	31,085 20	3.71	Oswego.
1829	817,919 28	32,171 04	3.91	
1830	1,045,163 42	29,364 91	2.77	
1831	751,268 62	27,686 13	3.72	
1832	1,112,917 74	30,191 44	2.60	
1833	1,388,380 53	32,477 33	2.30	
1834	1,387,715 02	32,327 39	2.37	Chemung and Crooked Lake.
1835	1,484,595 01	35,391 37	2.35	
1836	1,568,453 48	35,275 82	2.19	
1837	1,323,609 77	41,476 69	3.09	Chenango.
1838	1,465,275 16	36,466 94	2.45	
1839	1,655,788 56	54,329 85	3.20	
1840	1,606,827 28	53,691 83	3.30	
1841	1,989,696 71	53,247 08	2.66	Genesee Valley and Oneida Lake
1842	1,797,469 80	52,362 67	2.89	
1843	1,953,829 08	47,065 05	2.40	
1844	2,386,457 84	46,260 05	1.92	
1845	2,375,513 43	47,423 69	1.98	
1846	2,798,849 76	49,312 14	1.75	
1847	3,463,710 26	50,759 55	1.47	
1848	3,156,968 38	57,768 81	1.83	
1849	3,378,920 18	56,706 62	1.68	
1850	3,393,041 37	54,986 70	1.62	Black River.
1851	3,703,969 84	75,358 45	2.03	
1852	3,174,857 49	69,544 31	2.19	
1853	3,162,190 14	70,460 42	2.22	Baldwinsville.
1854	2,982,114 97	75,542 83	2.53	
1855	2,662,906 11	79,846 49	3.03	
1856	2,721,740 63	82,623 88	3.04	
1857	2,511,804 38	83,046 94	3.28	
1858	2,047,391 01	83,376 06	4.31	
1859	1,814,762 47	69,582 93	3.84	
1860	2,381,301 28	96,849 04	4.07	
1861	3,358,031 97	70,456 85	2.10	
1862	4,797,283 09	66,454 20	1.39	
1863	5,029,506 32	68,988 58	1.31	
1864	4,310,293 02	68,577 17	1.59	
1865	3,521,631 61	77,122 55	2.19	
1866	4,253,224 92	85,860 65	2.02	
1867	3,993,329 29	87,993 00	2.20	
1868	4,418,309 50	90,108 81	2.04	
1869	4,114,093 52	90,039 03	2.19	
1870	3,083,023 05	104,406 80	3.39	
1871	2,814,957 79	103,988 61	3.69	
1872	3,063,033 89	87,466 32	3.18	
1873	3,027,503 67	95,775 05	3.16	
1874	2,929,400 82	97,679 83	3.34	
1875	1,904,851 64	87,975 50	4.62	
1876	1,478,276 55	84,254 87	5.70	
1877	1,049,248 15	65,393 12	6.23	
1878	884,994 62	54,813 76	6.56	
1879	900,640 33	47,169 53	5.18	
1880	1,185,529 82	51,909 89	4.38	
1881	812,067 05	44,397 26	5.58	

(No. 57.)

STATEMENT showing: 1. The tolls (including rents from surplus waters) received in each fiscal year from 1826 to 1881. 2. The cost of repairs and collection of tolls. 3. The percentage which the cost of the maintenance of all the canals bears to the gross amount of tolls. 4. The aggregate tonnage of the total movement on all the canals, from 1833, when an account of tonnage was commenced, to 1880.

YEARS.	1 Tolls collected.	2 Expenses of collection and repairs.	3 Per cent of cost of main- tenance on tolls.	4 Tonnage of all canals.
1826.....	\$844,508 02	\$531,675 73	62.95	.....
1827.....	881,134 09	494,701 05	56.18	.....
1828.....	831,062 10	368,517 99	47.41	.....
1829.....	817,919 28	357,587 52	43.76	.....
1830.....	1,045,163 42	392,073 76	38.03	.....
1831*.....	751,263 62	224,419 83	29.82	.....
1832.....	1,112,917 74	428,964 78	38.54	.....
1833.....	1,388,880 53	487,797 32	35.15	.....
1834.....	1,387,715 02	534,897 82	38.54	.....
1835.....	1,484,595 61	510,524 76	34.41	.....
1836.....	1,568,455 48	467,599 39	29.22	1,310,807
1837.....	1,825,009 77	608,993 60	45.88	1,171,296
1838.....	1,405,275 16	622,027 29	42.42	1,331,011
1839.....	1,655,788 56	504,757 58	30.45	1,485,713
1840.....	1,606,827 28	575,020 58	35.80	1,416,046
1841.....	1,980,686 71	514,517 55	25.84	1,521,661
1842.....	1,797,463 80	642,584 30	35.72	1,236,931
1843.....	1,951,829 08	531,145 56	27.18	1,513,439
1844.....	2,388,457 34	636,857 72	26.63	1,816,586
1845.....	2,375,533 43	738,106 82	31.07	1,977,565
1846.....	2,798,849 76	689,353 01	22.88	2,268,662
1847.....	3,461,710 26	641,650 46	18.53	2,864,810
1848.....	3,150,908 88	855,850 64	27.11	2,796,230
1849.....	3,378,020 18	685,903 91	20.30	2,894,732
1850.....	3,363,081 37	835,965 81	24.64	3,070,617
1851.....	3,703,999 34	907,730 20	24.50	3,582,732
1852.....	3,174,857 49	1,049,045 92	33.04	3,863,441
1853.....	3,162,190 14	1,068,476 92	34.73	4,247,853
1854.....	2,982,114 97	1,237,866 20	41.51	4,165,862
1855.....	2,632,906 11	989,732 12	37.59	4,022,617
1856.....	2,721,740 63	786,663 40	28.90	4,116,082
1857.....	2,531,804 38	970,453 46	38.33	3,344,061
1858.....	2,047,291 01	1,078,878 91	52.69	3,665,192
1859.....	1,814,362 47	897,878 96	49.49	3,781,684
1860.....	2,381,301 28	746,976 78	31.33	4,650,214
1861.....	3,358,081 97	706,786 14	21.05	4,507,635
1862.....	4,797,283 09	773,398 32	16.12	5,568,785
1863.....	5,029,596 32	770,882 52	15.33	5,537,692
1864.....	4,310,293 02	1,028,909 46	23.87	4,832,941
1865.....	3,521,631 63	1,927,573 59	54.73	4,729,654
1866.....	4,253,224 92	1,434,989 73	33.74	5,175,220
1867.....	3,993,326 29	1,220,192 65	30.56	5,688,325
1868.....	4,418,309 50	1,184,245 04	26.80	6,442,225
1869.....	4,114,083 52	1,278,507 52	31.08	5,859,080
1870.....	3,083,023 05	+1,945,635 92	63.11	6,173,760
1871.....	2,814,853 79	+2,250,145 62	79.94	6,467,888
1872.....	3,063,034 89	\$1,078,020 32	67.84	6,673,370
1873.....	3,027,568 67	1,459,165 24	48.19	6,864,782
1874.....	2,823,400 62	1,469,406 83	50.26	5,804,588
1875.....	1,904,855 64	a1,414,456 94	74.25	4,859,858
1876.....	1,478,270 55	b1,202,053 63	81.32	4,172,129
1877.....	1,049,226 15	1,050,829 68	100.10	4,855,963
1878.....	984,934 62	739,748 97	75.10	5,171,320
1879.....	909,840 33	751,774 62	82.64	5,362,372
1880.....	1,185,529 82	889,015 84	74.99	6,457,656
1881.....	812,067 05	1,023,907 06	126.09	.....

The tonnage returns for 1881 are not all in, but may be seen in the report of "Tolls, Trade and Tonnage," yet to be made by the Auditor.

* Nine months.

+ Not including \$591,528.37, advanced by the Albany deposit banks.

‡ Including \$591,528.37, advanced by the Albany deposit banks.

§ Including \$202,344.01, reserved from revenues of 1871, for payments to contractors for repairs, in pursuance of chapter 633, Laws of 1871.

a Not including \$52,859.01, reserved from revenues of 1875, for unexpended balance of appropriation for reworking upper and lower Mohawk aqueducts, and concreting the sixteen locks.

b Including \$52,859.01, reserved from the revenues of 1875, for reworking upper and lower Mohawk aqueducts, and concreting the sixteen locks.

(No. 58.)

STATEMENT showing the receipts from tolls and other sources, the miscellaneous expenses of collection and repairs, and surplus revenues, from 1836 to 1881, in each fiscal year.

YEARS.	Tolls and miscellaneous receipts.	Expenses of collection and repairs.	Surplus revenues in each year.
1836.....	\$1,598,435 48	\$467,599 33	\$1,130,836 15
1837.....	1,325,609 77	608,993 60	716,616 17
1838.....	1,405,275 16	622,027 29	843,247 87
1839.....	1,655,788 66	504,757 53	1,151,031 03
1840.....	1,606,827 28	575,020 58	1,031,806 70
1841.....	1,989,686 71	514,517 55	1,475,169 16
1842.....	1,797,463 80	642,584 30	1,154,879 50
1843.....	1,953,829 03	531,145 56	1,422,683 47
1844.....	2,388,457 34	636,857 72	1,751,599 62
1845.....	2,875,533 43	738,106 32	1,637,427 11
1846.....	2,842,214 13	639,353 01	2,202,861 12
1847.....	3,473,484 60	641,650 08	2,831,834 52
1848.....	3,204,070 18	855,850 64	2,348,219 52
1849.....	3,442,906 62	665,803 91	2,757,102 71
1850.....	3,486,172 30	835,905 81	2,650,266 49
1851.....	3,722,163 11	907,730 20	2,814,432 91
1852.....	3,179,145 78	1,049,045 92	2,130,099 86
1853.....	3,166,546 51	1,098,476 92	2,070,069 59
1854.....	2,986,065 21	1,237,866 20	1,750,799 01
1855.....	2,630,792 12	989,792 12	1,650,000 00
1856.....	2,749,133 40	736,633 40	1,962,500 00
1857.....	2,559,489 06	970,453 48	1,589,035 60
1858.....	2,072,204 88	1,078,878 91	993,325 97
1859.....	1,850,879 63	897,878 96	952,000 67
1860.....	2,416,588 89	546,976 78	1,869,611 61
1861.....	3,402,623 30	706,786 14	2,695,837 16
1862.....	4,854,989 67	773,366 32	4,081,623 35
1863.....	5,119,501 35	770,832 52	4,347,668 83
1864.....	4,346,235 52	1,028,909 46	3,317,326 06
1865.....	3,577,403 45	1,927,373 59	1,650,029 86
1866.....	4,309,746 12	1,434,989 73	2,874,756 39
1867.....	4,050,357 79	1,220,102 65	2,830,255 14
1868.....	4,477,546 17	1,184,245 04	3,293,301 13
1869.....	4,161,280 10	1,278,507 52	2,882,772 58
1870.....	3,107,138 90	* 1,945,635 92	1,161,502 98
1871.....	2,842,549 94	† 2,250,145 62	592,404 32
1872.....	3,078,247 96	‡ 2,078,020 62	1,000,227 34
1873.....	3,082,452 04	1,459,165 24	1,623,286 80
1874.....	2,947,972 91	1,469,466 83	1,478,506 08
1875.....	1,925,995 63	\$ 1,467,315 95	458,679 68
1876.....	1,487,332 89	† 1,149,194 61	338,138 28
1877.....	1,053,361 01	1,050,329 68	8,031 33
1878.....	988,651 35	739,748 97	248,902 38
1879.....	921,252 81	751,774 82	169,477 99
1880.....	1,200,124 63	889,015 84	311,108 79
1881.....	818,364 61	1,023,907 06	1,205,542 45
Total tolls.....	\$123,713,497 06	\$45,862,972 23	\$77,850,525 43
Total expenses.....	45,862,972 23		
Total surplus revenues..	\$77,850,525 43		

* Not including \$591,528.37, advanced by the Albany deposit banks.

† Including \$591,528.37, advanced by the Albany deposit banks.

‡ Including \$202,344.01, reserved from the revenues of 1871 for payments to contractors for repairs, in pursuance of chapter 653, Laws of 1871.

§ Including \$52,859.01, unexpended balance of appropriation for retraining the upper and lower Mohawk aqueducts, and for concreting the sixteen locks.

† Not including \$52,859.01, paid out of the appropriation from revenues of previous year.

‡ Deficiency.

(No. 59.)

STATEMENT showing the progress of the Canal Debt, the amount paid for interest on loans and to the canal Commissioners and Superintendent of Public Works; also the surplus revenues in each fiscal year, from 1836 to 1881.

FISCAL YEAR.	PROGRESS OF THE CANAL DEBT.			PAID.		Surplus revenues in each fiscal year.
	Borrowed.	Redeemed.	Canal debt at close of each fiscal year.	Interest on loans.	Canal Commissioners and Superintendent of Public Works on all the canals.	
1836.....	\$650,000 00	\$351,240 16	\$9,296,806 73	\$298,714 86	\$977,550 83	\$1,170,856 15
1837.....	810,000 00	971,644 93	9,198,082 02	300,108 88	1,404,863 53	719,419 17
1838.....	3,093,000 00	351,023 15	9,308,190 41	446,789 88	1,640,070 19	843,217 87
1839.....	1,745,000 00	467,300 33	10,735,820 06	494,317 81	2,655,410 00	1,131,031 63
1840.....	8,416,555 90	137,728 22	14,133,377 76	659,881 58	5,005,515 75	1,031,846 79
1841.....	2,213,497 57	137,770 85	16,306,374 43	659,881 58	3,647,714 53	1,475,108 16
1842.....	8,411,618 00	143,600 03	19,574,862 45	1,000,497 81	2,589,419 81	1,154,879 50
1843.....	1,002,700 00	184,798 27	20,302,324 28	1,063,474 83	786,450 84	1,422,663 62
1844.....	655,000 00	833,418 60	20,713,905 58	1,116,728 53	1,151,599 62	1,761,599 62
1845.....	216,000 00	1,298,864 81	19,690,020 77	1,104,319 98	853,717 68	1,637,427 11
1846.....	800,000 00	2,901,780 64	17,028,240 13	978,552 48	182,867 30	2,302,861 12
1847.....	284,490 54	1,344,419 00	18,743,749 67	987,205 61	162,278 27	2,631,854 52
1848.....	1,314,819 34	1,844,919 00	18,713,649 91	911,738 05	894,767 86	2,348,219 62
1849.....	1,890,024 76	2,097,392 00	16,505,345 67	898,599 05	1,513,962 71	2,187,102 71
1850.....	1,22,295 49	482,789 74	16,215,144 62	868,873 74	2,182,870 83	2,650,266 49
1851.....	1,000,000 00	573,600 91	16,641,534 61	885,064 60	1,444,708 71	2,814,422 81
1852.....	700,000 00	340,295 45	17,001,269 16	843,765 63	1,381,254 63	2,130,079 80
1853.....	.....	478,025 00	17,001,269 16	960,710 28	1,022,005 84	2,070,039 59
1854.....	2,250,000 00	2,240,911 00	18,724,244 16	926,231 51	1,156,024 74	1,760,799 01
1855.....	8,750,000 00	4,498,296 34	20,281,383 10	1,076,673 17	2,638,707 23	1,650,000 00
1856.....	6,750,000 00	102,285 00	22,512,060 82	1,104,306 57	4,011,241 22	1,962,500 00
1857.....	2,750,000 00	2,929,707 34	25,189,781 82	1,301,738 83	2,841,636 58	1,589,015 60
1858.....	2,200,000 00	132,170 00	24,490,014 48	1,406,120 80	1,942,659 49	983,365 97
1859.....	8,000,000 00	1,100,523 00	24,307,844 48	1,358,862 32	656,159 49	962,000 67
1860.....	1,300,000 00	2,175,551 23	27,107,321 48	1,472,745 78	4,294,976 23	1,659,611 61
1861.....	.....	2,120,000 00	26,131,770 25	1,605,304 64	1,189,758 07	2,085,842 16
1862.....	.....	2,120,000 00	24,011,770 25	1,420,859 36	1,294,078 61	4,081,591 35
1863.....	.....	739,800 00	23,878,470 25	1,321,935 70	645,623 28	4,347,618 83
1864.....	.....	838,700 00	22,411,770 25	1,321,440 26	848,880 67	8,317,356 06
1865.....	.....	2,844,371 76	19,697,365 49	1,176,289 80	1,019,611 50	1,650,001 86
1866.....	.....	1,346,935 49	18,248,410 10	1,081,875 88	1,253,784 14	2,874,566 30
1867.....	.....	2,515,400 00	15,733,040 00	969,462 50	1,515,611 00	2,830,105 14
1868.....	.....	1,463,100 00	14,240,900 00	869,761 25	1,103,460 47	3,293,301 13

1866.....	1,683,180 00	12,544,730 00	802,210 25	1,894,018 75	7,892,772 58
1870.....	598,300 00	11,946,330 00	724,732 00	2,894,018 75	1,562,404 32
1871.....	.....	11,946,330 00	706,021 00	1,863,849 63	1,000,237 24
1872.....	2,182,800 00	11,396,860 00	673,052 50	1,846,370 69	1,623,296 80
1873.....	3,145,000 00	11,352,490 00	610,514 50	2,398,874 90	1,478,506 68
1874.....	2,004,000 00	10,520,430 00	581,819 58	2,416,590 92	838,138 23
1875.....	2,143,770 00	10,080,660 00	603,960 00	1,208,733 62	8,091 38
1876.....	473,000 00	10,081,160 00	548,396 86	701,116 61	244,902 38
1877.....	571,300 00	9,081,360 00	549,646 11	214,468 64	109,477 99
1878.....	860,000 00	8,030,360 00	540,323 00	235,231 91	811,118 79
1879.....	32,000 00	8,963,360 00	538,608 00	324,772 10	.....
1880.....	.....	8,963,360 00	538,608 00	557,628 03	.....
1881.....	5,000 00	.....	.....	.....	.....
Deduct the debt in 1835.....	.....	6,323,055 19	.....	.....	.....
Increase of debt, 1836 to 1881.....	.....	\$2,655,308 81	.....	.....	.....
Paid interest, 1836 to 1881.....	.....	.....	\$41,212,846 82	.....	.....
Paid Canal Commissioners and Superintendent of Public Works, 1836 to 1881.....	.....	.....	.....	\$71,915,170 85	.....
Amount of surplus revenues, 1836 to 1881.....	.....	.....	.....	.....	\$77,860,626 43

* Deficiency.

(No. 60.)

Names of Clerks employed by the Auditor of the Canal Department, the sums paid to each, and the length of time each was employed, from the 1st of October, 1880, to the 30th of September, 1881.

NAMES.	Annual salaries.	Time employed.	Paid on salaries.
Edmund Savage, deputy	\$3,500 00	12 months.....	\$3,500 00
George H. Birchall	1,800 00	12 months.....	1,800 00
Thomas W. Jaycox	1,800 00	12 months.....	1,788 75
Charles R. Allen	1,500 00	12 months.....	1,453 84
George W. Silingerland	1,850 00	12 months.....	1,850 00
Daniel Coney	1,800 00	3 months.....	600 00
Lausling H. Hackett.....	1,200 00	10 months 23 days..	976 07
H. J. McDonald	1,200 00	12 months.....	1,200 00
C. D. Austin	1,200 00	12 months.....	1,200 00
			\$12,823 76

of the same pe

	1879
34	\$55.00
07	17.00
77	17.00
26	21.00
13	11.00
50	12.00
38	8.00
66	19.40
05	15.90
60	25.20
20	19.80
06	\$225.17
42	21.31
27	27.16
81	19.70
06	\$293.36
11	18.21
4	6.50
1	3.41
1	1,722
6	02 46.1

e same period.

1879.	1880	1881.
\$55,025 57	\$61,639 99	\$57,289 33
17,239 85	23,505 82	31,570 91
17,432 01	23,292 91	23,901 32
21,389 49	26,001 87	20,763 85
11,998 89	17,051 97	18,360 93
12,861 53	16,932 24	16,697 07
8,697 18	13,903 89	13,855 65
19,432 47	19,485 49	21,827 71
15,980 08	28,656 67	36,844 40
25,261 55	25,875 12	30,667 81
19,861 21	28,817 96	38,675 50
.....
.....
.....
\$225,179 83	\$285,163 93	\$310,454 78
21,317 88	20,017 35	25,949 93
27,162 70	26,877 75	23,533 86
19,705 42	32,796 48	20,637 10
\$293,365 83	\$364,855 51	\$380,575 67
18,213 28	22,885 36	24,746 48
6,507 05	7,338 95	5,851 73
3,413 16	4,309 74	.....
.....
1,722 79	1,459 50	1,127 27
22,261 64	26,226 64	.....



(No. 62.)

STATEMENT showing the payments during the year ending September 30, 1881, to the Canal Appraisers and their clerks, for services, travel, postage, etc.

NAMES.	Services.	Travel.	Miscellaneous.	Total.
Wm. J. Morgan.....	\$5,000 00	\$500 00	\$200 65	\$5,700 65
Wm. L. Boatwick.....	5,000 00	480 03	3 00	5,483 03
Charles M. Dennison.....	5,000 00	800 90	7 84	5,817 24
D. J. Appar. chief clerk of Board.....	5,500 00	.....	.....	5,500 00
P. A. Hopkins.....	2,308 36	.....	.....	2,308 36
Robert Harris.....	1,458 84	.....	.....	1,458 84
Sundry persons.....	.....	.....	278 46	278 46
	\$22,166 70	\$1,280 93	\$488 45	\$23,936 08

(No. 62.)

STATEMENT showing the payments during the year ending September 30, 1881, to the Canal Appraisers and their clerks, for services, travel, postage, etc.

NAMES.	Services.	Travel.	Miscellaneous.	Total.
Wm. J. Morgan.....	\$5,000 00	\$500 00	\$200 65	\$5,700 65
Wm. L. Bostwick.....	5,000 00	450 03	3 00	5,453 03
Charles M. Dennison.....	5,000 00	200 90	7 84	5,317 24
D. J. Apgar, chief clerk of Board.....	5,500 00	.....	.....	5,500 00
P. A. Hopkins.....	2,208 86	.....	.....	2,208 86
Robert Harris.....	1,458 84	.....	.....	1,458 84
Sundry persons.....	.....	.....	\$78 46	\$78 46
	\$22,166 70	\$1,250 93	\$408 45	\$23,826 08

No. 63 — (Continued.)
ERIE CANAL ENLARGEMENT.

PAID.

YEARS.	Loans.	Temporary loans.	Interest on loans.	Interest on canal revenue certificates.	Canal Commissioners and Superintendent of Public Works.	Premium on purchase and investment of stock.	Miscellaneous.	Total.
1835.....					\$31,810 70			\$31,810 70
1836.....					68,218 83			68,218 83
1837.....					638,312 17			638,312 17
1838.....					1,163,196 12			1,179,744 90
1839.....			\$16,372 93		2,294,839 93		\$175 85	2,317,994 17
1840.....			231,190 72		8,282,870 66		13,350 23	8,476,011 63
1841.....		\$300,000 00	335,473 36		2,518,809 72		6,108 07	3,096,891 15
1842.....		1,200,000 00	459,985 03		1,521,152 51		8,377 46	3,196,515 00
1843.....			507,295 17		530,801 54		20,534 80	1,084,631 51
1844.....	\$6,000 00		594,159 82		418,692 06		27,324 90	1,080,076 78
1845.....			641,737 24		155,130 43		8,381 91	705,239 58
1846.....			550,920 50		70,012 35		48,653 61	669,586 46
1847.....			559,110 93		62,331 30		11,194 81	632,637 04
1848.....	1,837,940 37		529,713 62		624,573 08	\$3,829 25	27,411 17	2,830,473 89
1849.....	181,124 00		451,988 82		1,000,323 97		23,206 37	2,038,623 86
1850.....	74,048 00		419,488 02		1,365,695 06		14,919 08	1,879,050 10
1851.....	74,000 00		419,488 02		977,708 68		20,749 08	1,424,540 78
1852.....			419,488 02	\$21,640 51	913,148 04		30,257 31	1,384,434 48
1853.....	459,025 00		419,488 02	136,000 00	535,139 97		29,661 78	1,596,014 96
1854.....	40,975 00		411,968 02	90,000 00	583,443 11		27,929 19	1,566,014 96
1855.....	3,847,863 00		396,488 02	90,000 00	2,004,300 61		91,035 30	2,532,689 72
1856.....	3,102,265 00		396,488 02		3,168,676 89		455,844 39	2,532,689 72
1857.....	2,119,128 29		164,169 04		2,322,705 33		41,416 44	2,532,689 72
1858.....	159,723 00		68,212 10		1,936,124 28		47,730 04	2,532,689 72
1859.....	590,290 65		68,819 04		2,270,916 11		108,830 42	2,532,689 72
1860.....	42,577 00		40,840 00		685,329 89		29,194 50	2,532,689 72
1861.....	687,000 00		30,865 27		1,631,089 62		78,971 15	1,393,190 91
1862.....	3,000 00		11,305 00		576,894 66		78,971 15	252,611 79
1863.....	144,700 00				27,848 94		82,075 70	612,176 86
1864.....	82,300 00				185,800 99		27,804 04	389,452 98
1865.....	2,000 00				51,825 59		27,606 04	215,204 02
1866.....							6,532 60	69,468 13
1867.....								

No. 64 — (Continued).
OSWEGO CANAL.

YEARS.	DEFICIENCIES.		PAID.					Total.		
	Paid by the General Fund.	Paid by the Erie and Champlain canals.	Principal of loans.	Surplus tolls Erie and Champlain canals.	Interest on loans.	Canal Commissioners and Superintendent of Public Works.	Superintendents of repairs.		Expenses of collectors and inspectors.	Miscellaneous.
1896.	\$5,088 81	\$237,015 57	.....	.....	.....	\$242,099 38
1897.	11,350 00	175,231 00	.....	.....	.....	186,571 00
1898.	18,917 35	83,774 46	.....	.....	.....	111,609 81
1899.	21,850 00	43,319 99	.....	.....	.....	79,699 37
1900.	21,850 00	3,310 00	.....	.....	.....	40,324 30
1901.	\$16,083 16	.....	\$9,663 00	.....	16,146 18	.....	.....	.....	.....	42,583 98
1902.	13,683 53	.....	.....	.....	21,367 38	.....	.....	.....	.....	37,507 62
1903.	17,692 61	.....	.....	.....	21,367 38	.....	.....	.....	.....	34,619 11
1904.	13,738 88	.....	.....	.....	21,367 38	.....	.....	.....	.....	35,888 35
1905.	12,649 53	.....	.....	.....	21,216 23	.....	.....	.....	.....	38,075 75
1906.	9,028 24	.....	.....	.....	21,065 20	.....	.....	.....	.....	90,319 73
1907.	43,942 97	.....	6,043 00	.....	21,065 20	.....	.....	.....	.....	78,437 28
1908.	44,857 31	.....	.....	.....	21,065 20	.....	.....	.....	.....	48,776 43
1909.	54,490 70	.....	.....	.....	21,065 20	.....	.....	.....	.....	60,232 04
1910.	11,497 62	.....	.....	.....	21,065 20	.....	.....	.....	.....	50,300 11
1911.	80,760 23	.....	.....	.....	21,065 20	.....	.....	.....	.....	54,393 41
1912.	\$15,345 06	.....	.....	21,065 20	.....	.....	.....	.....	46,673 66
1913.	18,383 59	.....	.....	21,065 20	.....	.....	.....	.....	57,780 84
1914.	14,659 45	.....	.....	21,065 20	.....	.....	.....	.....	70,720 23
1915.	7,787 60	.....	.....	21,065 20	.....	.....	.....	.....	46,673 66
1916.	16,890 00	.....	.....	21,065 20	.....	.....	.....	.....	57,780 84
1917.	13,506 25	.....	.....	16,041 54	.....	.....	.....	.....	70,720 23
1918.	387,248 45	.....	.....	.....	.....	.....	.....	46,673 66
1919.	84,055 55	.....	.....	.....	.....	.....	.....	46,673 66
1920.	6,231 19	.....	.....	.....	.....	.....	.....	.....	46,673 66
1921.	46,673 66
1922.	46,673 66
1923.	46,673 66
1924.	46,673 66
1925.	46,673 66
1926.	46,673 66
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1934.	46,673 66
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1951.	46,673 66
1952.	46,673 66
1953.	46,673 66
1954.	46,673 66
1955.	46,673 66
1956.	46,673 66

No. 64 — (Continued).
OSWEGO CANAL.

YEARS.	DEFICIENCIES.		PAID.					Total.		
	Paid by the General Fund.	Paid by the Erie and Champlain canals.	Principal of loans.	Surplus tolls Champlain canals.	Interest on loans.	Canal Commissioners and Superintendent of Public Works.	Superintendents of repairs.		Expenses of collectors and inspectors.	Miscellaneous.
1826	.....	.....	.....	.....	\$5,088 81	\$227,015 57	.....	.....	.....	\$242,099 38
1827	.....	.....	.....	.....	11,350 00	175,221 00	.....	.....	.....	186,571 00
1828	.....	.....	.....	.....	18,917 85	83,774 46	.....	.....	\$500 00	111,809 81
1829	.....	.....	.....	.....	21,850 00	43,319 99	.....	.....	400 04	79,869 37
1830	.....	.....	.....	.....	21,850 00	3,310 00	.....	.....	394 54	40,324 30
1831	\$16,083 18	.....	\$9,653 00	.....	16,148 18	.....	.....	.....	.....	42,583 98
1832	12,683 53	.....	.....	.....	21,367 86	.....	.....	.....	6,057 55	37,607 62
1833	17,892 61	.....	.....	.....	21,367 86	.....	.....	.....	1,657 88	34,819 11
1834	18,738 89	.....	.....	.....	21,367 86	.....	.....	.....	.....	34,819 11
1835	12,649 83	.....	.....	.....	21,367 86	.....	.....	.....	.....	34,819 11
1836	9,028 24	.....	.....	.....	21,367 86	.....	.....	.....	.....	34,819 11
1837	43,943 97	.....	6,043 00	.....	21,045 20	.....	.....	.....	.....	34,819 11
1838	44,857 31	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1839	51,460 70	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1840	30,160 83	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1841	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1842	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1843	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1844	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1845	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1846	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1847	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1848	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1849	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1850	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1851	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1852	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1853	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1854	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1855	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11
1856	.....	.....	.....	.....	21,045 20	.....	.....	.....	.....	34,819 11

1859.....	\$227,000 00	\$9,000 00	\$246,000 00	\$230,470 05	\$11,962 50	\$1,063,030 35	\$1,586,240 29	48,371 29	68,700 82	\$146,497 44	\$313,371 99
1860.....	.....	.....	.....	.....	.....	.....	.....	140,044 72	160,153 81	.....	.....
1861.....	.....	.....	.....	.....	.....	.....	.....	172,411 21	91,189 63	.....	.....
1862.....	.....	.....	.....	.....	.....	.....	.....	144,413 71	104,869 63	.....	.....
1863.....	.....	.....	.....	.....	.....	.....	.....	80,146 99	56,360 82	.....	.....
1864.....	.....	.....	.....	.....	.....	.....	.....	88,872 84	66,412 63	.....	.....
1865.....	.....	.....	.....	.....	.....	.....	.....	70,791 20	94,583 42	.....	.....
1866.....	.....	.....	.....	.....	.....	.....	.....	29,811 36	68,962 00	.....	.....
1867.....	.....	.....	.....	.....	.....	.....	.....	4,264 88	38,968 36	.....	.....
1868.....	.....	.....	.....	.....	.....	.....	.....	13,814 24	45,470 35	.....	.....
1869.....	.....	.....	.....	.....	.....	.....	.....	11,436 39	47,805 80	.....	.....
1870.....	.....	.....	.....	.....	.....	.....	.....	102,965 63	131,994 41	.....	.....
1871.....	.....	.....	.....	.....	.....	.....	.....	24,240 04	46,541 73	.....	.....
1872.....	.....	.....	.....	.....	.....	.....	.....	26,531 23	44,418 90	.....	.....
1873.....	.....	.....	.....	.....	.....	.....	.....	6,921 06	39,413 38	.....	.....
1874.....	.....	.....	.....	.....	.....	.....	.....	34,346 86	53,697 78	.....	.....
1875.....	.....	.....	.....	.....	.....	.....	.....	25,992 40	39,598 47	.....	.....
1876.....	.....	.....	.....	.....	.....	.....	.....	675 13	11,769 12	.....	.....
1877.....	.....	.....	.....	.....	.....	.....	.....	52 45	6,639 80	.....	.....
1878.....	.....	.....	.....	.....	.....	.....	.....	24,947 80	28,157 80	.....	.....
1879.....	.....	.....	.....	.....	.....	.....	.....	.....	1,998 21	.....	.....
1880.....	.....	.....	.....	.....	.....	.....	.....	.....	1,423 57	.....	.....
1881.....	.....	.....	.....	.....	.....	.....	.....	.....	1,065 27	.....	.....
Total.....	\$227,000 00	\$9,000 00	\$246,000 00	\$230,470 05	\$11,962 50	\$1,063,030 35	\$1,586,240 29	.....	\$3,127,723 19	.....	.....
									459,899 43		
									\$3,587,622 62		

Deficiencies paid by General Fund and Erie and Champlain canals.

* Nine months.

No. 65 — (Continued.)
CAYUGA AND SENECA CANAL.

PAID.

YEARS.	Principal of loans.	Interest on loans.	Surplus tolls to Erie and Champlain canals.	Canal Commis- sioners and Superintend- ent of Public Works.	Seneca Lock and Navigation Company.	Superintend- ents of re- pairs.	Collectors.	Miscella- neous.	Total.
1886		\$3,873 28		\$8,094 47	\$24,095 83		\$255 88	\$145 23	\$46,819 41
1887		7,500 00		45,382 70	19,776 03			8,481 87	122,713 98
1888		7,500 00		80,918 64				2,331 00	106,900 41
1889		9,866 55		20,783 53					25,896 01
1890		11,850 00		6,885 55					16,616 69
1891*		8,887 60						3,605 80	17,082 02
1892		11,850 00		100 00				300 00	21,896 62
1893		11,850 00							21,814 80
1894		11,850 00		90 00					23,648 12
1895		11,850 00							26,634 73
1896		11,850 00							43,886 29
1897		11,850 00							33,006 44
1898		11,850 00							37,245 85
1899		11,850 00							38,047 25
1900		11,850 00							31,745 80
1901		11,850 00		2,065 41					38,902 09
1902		11,850 00		10,819 24					24,287 64
1903		11,850 00		4 52					27,319 80
1904		11,850 00							27,257 24
1905		9,975 00							174,489 53
1906	\$150,000 00	4,350 00	\$10,377 25	756 40					31,268 73
1907		4,350 00	13,543 22						32,830 86
1908		3,262 50		51,922 60					140,386 64
1909	71,896 00			70,219 79					97,289 86
1910	15,114 00			7,038 48					31,023 71
1911				2,098 00					30,870 85
1912				14,223 35					39,055 74
1913				64,246 84					141,738 90
1914				117,581 09					180,232 31
1915				186,797 28					186,042 44
1916				186,869 26					225,233 20
1917				134,307 79					
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1863	7,233 33	19,901 96	2,459 42	29,594 71
1863	21,653 77	4,853 02	23,211 79
1864	23,406 83	15,597 95	39,244 71
1865	.....	.....	.....	.....	.....	.....	.....	18,745 91	31,678 14	43,424 05
1866	.....	.....	.....	.....	.....	.....	.....	16,173 04	80,357 91	104,530 95
1867	.....	.....	.....	.....	.....	.....	.....	14,623 14	91,230 91	105,744 05
1868	.....	.....	.....	.....	.....	.....	.....	12,232 96	25,530 11	38,062 09
1869	.....	.....	.....	.....	.....	.....	.....	9,514 27	39,061 95	49,176 23
1870	.....	.....	.....	.....	.....	.....	.....	5,894 90	86,398 46	95,308 36
1871	.....	.....	.....	.....	.....	.....	.....	6,187 79	94,498 07	100,685 86
1872	.....	.....	.....	.....	.....	.....	.....	4,120 81	35,550 15	39,670 95
1873	.....	.....	.....	.....	.....	.....	.....	8,729 06	22,310 05	36,539 11
1874	.....	.....	.....	.....	.....	.....	.....	2,914 44	6,915 77	9,830 21
1875	.....	.....	.....	.....	.....	.....	.....	1,717 32	14,426 49	16,143 81
1876	.....	.....	.....	.....	.....	.....	.....	2,104 84	7,575 31	10,061 05
1877	.....	.....	.....	.....	.....	.....	.....	3,211 64	.....	8,211 64
1878	.....	.....	.....	.....	.....	.....	.....	2,678 55	34,992 67	27,661 23
1879	.....	.....	.....	.....	.....	.....	.....	742 01	3,787 70	4,529 71
1880	.....	.....	.....	.....	.....	.....	.....	.....	124 32	.....
1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	.....	\$683,600 58	\$41,380 26	\$14,232 23	\$690,668 61	\$20,000 00	\$526 36	\$525,425 97	\$654,601 18	\$2,774,304 38
Deficiencies paid by General Fund and Erie and Champlain canals										
										1,967,021 68
										\$4,741,226 00

* Nine months.

No. 66—(Continued).
CHEMUNG CANAL.

YEARS.	DEFICIENCIES.		PAID.					Collectors.	Miscellaneous.	Total.
	Paid by the General Fund.	Paid by the Erie and Champlain canals.	Principal of loans.	Temporary loans.	Interest on loans.	Canal Commissioners and Superintendent of Public Works.	Superintendents of repairs.			
1830.	\$3,125 00	\$69,190 00	.....	.....	.....	\$72,315 00
1831.	1,378 29	148,291 57	.....	.....	\$2 10	155,671 46
1832.	14,513 16	76,410 47	.....	.....	16 05	90,939 68
1833.	14,891 29	47,783 38	.....	.....	400 00	60,553 30
1834.	15,800 04	2,258 91	.....	.....	253 03	43,721 04
1835.	15,800 04	9 06	.....	.....	.....	23,021 79
1836.	15,800 08	.....	.....	.....	.....	28,461 07
1837.	15,800 08	3,558 91	.....	.....	.....	35,643 74
1838.	15,800 00	1,859 91	.....	.....	.....	34,311 12
1839.	15,800 00	.....	.....	.....	3,552 06	31,313 65
1840.	15,835 21	68 50	.....	.....	.....	29,108 07
1841.	23,175 22	100,056 81	.....	.....	103 39	143,072 17
1842.	\$7,000 00	.....	25,827 49	38,451 59	.....	.....	157 55	253,503 07
1843.	8,000 00	.....	34,620 11	25,417 42	.....	.....	60 65	103,732 98
1844.	\$20,000 00	35,678 69	8,467 07	.....	.....	224 40	63,732 38
1845.	35,862 83	.....	.....	.....	573 00	64,698 55
1846.	35,944 31	9 90	.....	.....	109 00	63,643 00
1847.	35,934 59	1,646 08	.....	.....	109 00	67,535 00
1848.	35,934 59	4,280 98	.....	.....	172 35	67,545 92
1849.	35,934 59	10,576 98	.....	.....	1,274 46	219,512 21
1850.	35,934 59	55,708 68	.....	.....	90 20	360,730 81
1851.	35,934 59	11,044 42	.....	.....	673 15	408,665 55
1852.	10,571 26	12,665 24	.....	.....	70 20	408,665 55
1853.	10,571 26	10,384 21	.....	.....	673 15	408,665 55
1854.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1855.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1856.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1857.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1858.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1859.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1860.	10,384 21	10,384 21	.....	.....	673 15	408,665 55
1861.	10,384 21	10,384 21	.....	.....	673 15	408,665 55

1892	50,100 83	7,000 00	223 85	81,911 75	7,028 96	2,594 82	20,056 58	119,695 24
1893	63,063 56	.....	.....	84,894 80	58,824 59	2,326 50	19,827 94	106,205 42
1894	47,387 64	.....	.....	49,200 86	12,869 91	2,302 74	25,484 14	89,027 05
1895	57,387 56	.....	.....	49,480 78	16,718 24	2,845 45	72,738 08	135,781 63
1896	40,811 69	.....	.....	91,784 34	18,219 19	3,189 21	88,650 80	149,842 64
1897	65,714 98	.....	.....	58,708 79	8,207 04	3,318 19	78,225 01	171,459 03
1898	51,145 31	.....	.....	84,104 40	.....	9,981 94	89,207 40	80,736 63
1899	31,550 41	.....	.....	40,185 18	1,431 17	8,110 88	86,000 00	80,736 63
1900	60,991 03	.....	.....	107,850 46	838 09	8,821 28	30,790 96	143,238 39
1870	91,457 15	.....	.....	97,701 57	2,912 31	8,801 68	87,067 45	182,143 01
1871	79,813 99	.....	.....	47,584 64	30,061 79	8,740 84	87,597 08	118,964 95
1872	33,287 58	.....	.....	81,563 17	81,897 65	8,066 88	7,868 84	09,828 64
1873	35,676 51	.....	.....	7,822 08	34,004 86	8,691 80	2,438 66	46,506 72
1874	24,045 88	.....	.....	14,308 22	20,816 02	2,547 79	400 65	40,189 60
1875	7,880 87	.....	.....	10,515 01	5,202 27	1,659 99	17,770 82	21,706 45
1876	18,491 81	.....	.....	35,235 72	20,657 21	1,049 24	873 82	44,092 83
1877	6,431 61	.....	.....	4,943 51	7,479 51	503 78	94 70	8,675 11
1878	4,145 40	.....	.....	1,933 65	3,413 16	223 74	.....	6,243 87
1879	6,119 07	.....	.....	6,108 47	4,309 74	.....	.....	6,103 47
1881	6,103 47	.....	.....	.....	.....	.....	.....	.....
Total	\$1,725,877 03	\$20,000 00	\$571,319 91	\$1,804,003 71	\$1,023,502 53	\$96,212 70	\$502,556 48	\$4,741,226 00

* Nine months.

(No. 67.)

STATEMENT of receipts and payments on account of the Crooked Lake canal, in each year, up to September 30, 1881, inclusive, viz.:

YEARS.	Loans.	Premium on loans.	RECEIVED.				DEFICIENCIES.		
			Avails of loans.	From Sinking Fund.	Tolls.	Miscellaneous.	Total.	Paid by the Gen'l Fund.	Paid by the Erie and Champlain canals.
1851*	\$100,000 00	.....	\$100,000 00	.....	.....	.....	\$100,000 00	.....	.....
1852	46,369 50	.....	.....
1853	20,000 00	\$20,402 26	40,402 26	.....	\$1,007 60	\$5,997 24	46,369 50	\$12,829 88	.....
1854	1,808 76	.....	1,808 76	8,243 36	.....
1855	1,953 90	.....	1,953 90	9,794 28	.....
1856	1,547 61	.....	1,547 61	10,823 54	.....
1857	1,566 06	.....	1,566 06	11,037 55	.....
1858	1,863 90	.....	1,863 90	7,769 82	.....
1859	1,613 16	.....	1,613 16	9,819 79	.....
1860	2,028 46	.....	2,028 46	.....	\$14,429 46
1861	1,216 73	.....	1,216 73	.....	13,718 06
1862	1,341 60	.....	1,341 60	.....	9,213 34
1863	1,367 21	.....	1,367 21	.....	9,380 60
1864	1,863 84	.....	1,863 84	.....	10,049 11
1865	1,840 87	.....	1,840 87	.....	86,771 78
1866	1,714 55	.....	1,714 55	.....	81,787 10
1867	1,868 04	.....	1,868 04	.....	66,070 49
1868	1,868 17	.....	1,868 17	.....	11,841 26
1869	1,786 17	.....	1,786 17	.....	13,225 84
1870	1,714 34	.....	1,714 34	.....	11,773 68
1871	1,240 02	.....	1,240 02	.....	7,664 32
1872	1,654 75	.....	1,654 75	.....	4,661 75
1873	1,333 69	.....	1,333 69	.....	4,740 43
1874	837 48	.....	837 48	.....	6,371 36
1875	1,154 48	.....	1,154 48	.....	4,447 78
1876	879 26	.....	879 26	.....	11,812 66
1877	520 83	.....	520 83	.....	10,409 09
1878	715 06	.....	715 06	.....	4,936 49
1879	668 34	.....	668 34	.....	6,016 78
1880	698 94	.....	698 94	.....	6,384 27
1881	712 7	.....	712 7	.....	7,300 21
1882	712 70	.....	.....

No. 67 — (Continued).
CROOKED LAKE CANAL.

PAID.

YEARS.

YEARS.	Principal of loans.	Interest on loans.	Canal Commis- sioners and Superintend- ent of Public Works.	Superintend- ents of repairs.	Collectors.	Miscellaneous.	Total.
1831*	\$1,537 67	\$11,350 00	.....	.....	.....	\$12,887 67
1832	6,000 00	62,906 46	.....	.....	.....	67,906 46
1833	6,250 00	52,461 80	.....	.....	.....	57,711 80
1834	6,000 00	13,288 82	.....	.....	.....	21,231 40
1835	6,000 00	1 70	\$2,437 67	\$360 75	.....	10,047 11
1836	6,000 00	255 90	5,083 82	435 25	.....	11,748 18
1837	6,000 00	402 81	5,743 71	735 13	\$3 21	12,871 15
1838	6,000 00	.....	5,080 07	543 54	.....	11,603 61
1839	6,000 00	.....	2,778 31	885 11	.....	9,663 42
1840	6,000 00	.....	4,559 23	873 65	.....	11,432 88
1841	6,000 00	.....	9,463 07	987 85	.....	16,452 92
1842	6,000 00	.....	8,019 46	918 13	.....	14,934 59
1843	6,000 00	.....	8,674 16	880 78	.....	10,554 94
1844	6,000 00	.....	2,863 84	842 08	.....	10,747 90
1845	6,000 00	.....	4,844 67	837 28	.....	11,710 95
1846	6,000 00	28,358 42	5,384 00	815 73	.....	88,618 16
1847	6,000 00	46,030 76	6,065 89	875 00	.....	99,971 63
1848	6,000 00	57,498 73	8,538 88	861 87	.....	72,384 33
1849	6,000 00	2,163 61	10,208 40	888 42	.....	19,285 43
1850	6,000 00	10,131 25	6,119 94	777 04	.....	140,182 03
1851	\$120,000 00	6,429 28	6,429 28	7,975 12	964 84	.....	18,563 02
1852	1,760 62	6,360 00	925 42	.....	10,051 18
1853	6,122 08	968 50	.....	6,308 50
1854	1,719 65	5,320 39	922 04	.....	7,963 77
1855	2,566 30	6,094 16	888 45	.....	8,774 04
1856	780 00	.....	888 02	3,240 08	5,662 26
1857	7,540 70	199 98	703 86	4,447 87	12,691 91
1858	584 30	.....	542 25	9,803 46	10,927 91
1859	147 78	.....	440 08	5,062 68	5,650 55
1860	467 84	.....	670 34	5,087 54	5,830 12
1861	573 10	125 00	488 98	6,017 13	7,084 21
1862	284 90	2,463 94	685 08	4,698 38	8,041 91
1863	5,305 66	.....	555 56	5,111 76	8,003 98

(No. 68.)

STATEMENT of receipts and payments on account of the Chenango canal in each year, up to September 30, 1881, inclusive, viz.:

YEARS.	Loans.	Premiums on loans.	Discount on loans.	RECEIVED.					
				Avails of loans.	Erie and Champlain tolls to redeem stock.	From Sinking Fund.	Tolls.	Miscellaneous	Total.
1853	\$50,000 00	\$7,755 00	.....	\$57,755 00	.....	.....	.....	.....	\$57,755 00
1854	950,000 00	66,255 00	.....	1,016,255 00	.....	.....	.....	.....	1,016,255 00
1855	.....	.....	.....	.....	.....	.....	.....	.....	.....
1856	650,000 00	13,000 00	.....	663,000 00	.....	.....	.....	.....	663,000 00
1857	620,000 00	5,979 87	.....	625,979 87	.....	.....	.....	.....	625,979 87
1858	92,535 68	.....	.....	92,535 68	.....	.....	.....	.....	92,535 68
1859	20,000 00	500 00	.....	20,500 00	.....	.....	.....	.....	20,500 00
1860	20,000 00	.....	\$975 00	19,095 00	.....	.....	.....	.....	19,095 00
1861	.....	1841	.....	.....	.....	.....	.....	.....	.....
1862	6,102 34	6,102 34	6,102 34
1863	8,362 00	8,362 00	8,362 00
1864	3,000 00	3,000 00	3,000 00
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No. 68 — (Continued).

CHENANGO CANAL.

YEARS.	DEFICIENCIES.		PAID.						Total.		
	Paid by the General Fund.	Paid by the Erie and Champlain canals.	Principal of loans.	Interest on loans.	Surplus to Erie and Champlain canals.	Canal Commission and Superintendent of Public Works.	Superintendents of repairs.	Expenses of collectors and inspectors.		Miscellaneous.	
1833				\$1,042 81		\$9,222 65				\$57 33	\$10,282 79
1834				25,010 00		211,013 44					230,633 30
1835				50,000 00		651,783 45				67 36	701,849 81
1836				65,637 81		911,038 10				228 90	976,901 81
1837				88,237 38		490,807 02				315 81	588,013 84
1838	\$102,749 16			133,445 60		63,759 17	\$18,663 63	\$1,074 85		35 48	220,588 11
1839	136,012 97			118,428 60		47,458 98	20,270 95	1,578 00		803 60	220,588 11
1840	118,994 25			119,578 79		12,222 90	14,775 24	1,559 66		4,417 36	185,256 02
1841	121,774 87			120,328 78		5,849 47	16,538 05	1,831 42		563 88	144,809 58
1842	\$122,003 21			120,450 79		5,075 33	18,467 28	1,821 42		6,291 85	132,106 25
1843	125,408 50			120,474 23		6,686 05	15,917 35	1,385 40		2,621 08	148,518 80
1844	123,618 04			120,974 23		8,912 72	15,700 51	1,233 02		1,346 59	148,518 80
1845	117,946 44			121,895 96		153 95	18,283 33	1,198 91			141,011 08
1846	116,938 47		\$2,338,310 66	83,219 03		182 47	17,827 13	1,132 00		730 98	2,389,572 27
1847	26,799 40		22,195 00	8,273 89	\$4,983 97	2,704 28	18,404 54	1,228 00		842 77	32,635 44
1848			3,430 00	3,172 09	5,897 85	119 06	20,471 02	1,418 49		7,264 72	41,880 02
1849			6,702 34	2,851 72		817 88	27,772 21	1,442 12		2,785 57	42,682 21
1850				2,851 72		5,051 91	25,071 12	1,237 68		2,822 45	37,034 88
1851				2,851 72		1,084 75	31,110 32	1,426 08		80 67	38,038 54
1852			20,000 00	1,651 72		6,112 00	34,706 26	1,389 94			63,109 92
1853				1,651 72			37,752 37	1,400 79		98 35	40,903 28
1854			20,000 00	901 72			49,478 20	1,403 87			71,781 29
1855				551 72		8,065 35	44,250 04	1,557 00			49,554 11
1856				651 72		1,586 35	10,301 24	1,723 88		12,224 30	25,500 47
1857				651 72		1,100 00	2,276 18	1,923 30		25,800 70	38,817 79
1858				651 72		616 21	23,785 36	1,981 10		21,001 75	48,066 87
1859				651 72		1,933 72	3,450 19	1,383 66		22,910 56	30,339 85
1860			8,322 00	526 29		11,757 84	1,493 65	1,761 57		25,175 90	49,477 55
1861				150 00		38,067 72	1,210 84	1,714 35		21,431 66	63,684 70
1862			3,000 00	100 00		12,577 91	1,215 86	1,904 86		28,065 56	46,880 19
1863						9,357 43	1,620 78	1,904 86		31,41 24	41,623 81
1864						38,410 12	3,210 97	2,107 10		38,143 12	81,871 31

No. 69 — (Continued.)
BLACK RIVER CANAL.

YEARS.	DEFICIENCIES.		PAID.							
	Paid by the General Fund	Paid by the Erie and Champlain canals.	Principal of the loans.	Temporary loans.	Interest on the loans.	Canal Com-misloners and Superin-tendents of Public Works.	Superin-tendents.	Collectors.	Miscellane-ous.	Total.
1837	\$2,280 44	\$5,255 55	.....	.....	.....	\$7,494 99
1838	29,283 97	97,735 21	.....	.....	.....	127,124 18
1839	20,572 28	512,154 39	.....	.....	.....	542,726 67
1840	\$58,711 89	.....	.....	89,793 87	537,794 74	.....	.....	110 39	577,696 00
1841	\$50,681 16	.....	\$150,000 00	53,168 39	335,973 06	.....	.....	28 88	539,174 83
1842	74,186 24	.....	200,000 00	73,186 24	224,824 84	.....	.....	47 75	509,068 38
1843	81,641 08	.....	.....	81,641 08	24,928 61	.....	.....	.....	106,568 69
1844	88,171 09	.....	18,987 00	83,171 09	14,928 33	.....	.....	480 75	117,147 17
1845	84,400 46	.....	.....	84,400 46	89,147 14	.....	.....	672 95	134,220 55
1846	85,240 30	.....	.....	85,240 30	19,852 14	.....	.....	520 12	98,912 56
1847	86,122 84	12,826 24	.....	.....	545 66	91,994 74
1848	\$355,988 65	.....	86,122 84	106,922 95	.....	.....	9,268 37	203,906 16
1849	8,898 79	.....	.....	79,983 03	235,373 97	.....	.....	112 25	699,367 90
1850	22,226 53	486,514 85	.....	61,293 63	151,492 08	.....	\$10,014 53	216 16	222,928 24
1851	25,774 22	813,483 15	.....	40,528 01	98,590 17	.....	.....	838 11	649,750 55
1852	19,429 53	.....	.....	91,478 91	31,957 28	.....	.....	395 44	484,082 97
1853	21,676 39	.....	.....	91,913 63	98,124 81	.....	.....	329 20	85,013 69
1854	21,676 39	.....	.....	91,913 63	106,922 95	.....	.....	364 40	163,531 95
1855	29,616 30	.....	.....	21,293 63	49,437 29	.....	.....	18,687 81	139,849 88
1856	12,191 33	.....	.....	21,293 63	81,674 72	.....	.....	19,708 16	104,971 63
1857	6,423 15	.....	.....	17,144 80	41,297 89	.....	.....	26,510 74	368,246 08
1858	14,123 15	367,808 23	.....	7,368 31	10,080 62	.....	.....	26,010 29	160,968 00
1859	21,607 03	8,800 00	.....	6,463 73	101,080 62	.....	.....	21,829 80	131,448 65
1860	18,646 54	60,805 12	.....	2,900 00	103,563 31	.....	.....	17,394 93	131,448 65
1861	17,192 05	.....	.....	2,900 00	33,570 86	.....	.....	21,529 84	131,448 65
1862	14,935 27	.....	.....	2,900 00	103,563 31	.....	.....	21,529 84	131,448 65
1863	10,668 18	.....	.....	1,900 00	10,668 18	.....	.....	21,529 84	131,448 65
1864	13,563 12	.....	.....	1,900 00	10,668 18	.....	.....	21,529 84	131,448 65
1865	48,912 70	.....	.....	.....	10,668 18	.....	.....	21,529 84	131,448 65
1866	37,863 30	.....	.....	.....	10,668 18	.....	.....	21,529 84	131,448 65
1867	25,720 08	.....	.....	.....	10,668 18	.....	.....	21,529 84	131,448 65
1868	10,668 18	.....	.....	21,529 84	131,448 65
1869	10,668 18	.....	.....	21,529 84	131,448 65

1870.....	189,417 75	.....	.....	.....	60,814 40	49,913 81	1,013 83	142,411 01	235,062 59
1871.....	117,975 13	.....	.....	.....	54,035 20	94,404 23	1,981 26	12,180 00	103,909 87
1872.....	76,702 30	.....	.....	.....	32,187 53	73,783 94	1,735 10	11,829 73	119,479 35
1873.....	50,679 84	.....	.....	.....	85,489 14	67,439 50	1,039 23	55 06	124,013 45
1874.....	22,555 57	.....	.....	.....	299,778 78	60,715 18	1,835 73	25,449 29	387,878 98
1875.....	38,961 03	.....	.....	.....	53,744 68	40,727 07	1,034 50	5,994 21	101,600 46
1876.....	23,724 95	.....	.....	.....	8,430 18	23,564 38	1,039 75	125 87	88,179 63
1877.....	88,511 24	.....	.....	.....	257 17	53,035 22	1,076 42	12 22	54,381 23
1878.....	23,580 89	.....	.....	.....	3,806 44	22,184 90	1,033 86	34 23	87,059 49
1879.....	22,272 99	.....	.....	.....	15,795 09	25,761 64	1,038 86	.....	42,579 09
1880.....	32,592 88	.....	.....	.....	24,013 79	23,736 62	1,042 14	.....	51,362 55
1881.....	59,728 66	.....	.....	.....	54,909 91	25,243 50	905 41	278 06	81,037 50
Total	\$56,711 29	\$1,682,191 23	\$1,564,000 00	\$368,967 00	\$1,064,370 87	\$339,683 44	\$33,868 13	\$630,111 54	\$8,460,024 98
Balance on hand 30th September, 1881.	.....	.....	.....	.....	.....	.....	.....	.....	824 83
									\$8,460,849 91

(No. 70.)

STATEMENT of receipts and payments on account of the Genesee Valley canal, in each year, up to the 30th September, 1881, inclusive, viz.:

YEARS	Loans.	Premium on loans.	Discount on loans.	RECEIVED.								
				Avails of loans.	Temporary loans.	From Sinking Fund.	From other funds.	Tolls.	Interest on deposits.	Miscellaneous.	Total.	
1837.	\$11,704 71	\$1,315 29	.....	\$13,000 00	.....	.....	.....	.....	.....	\$90,120 52	.....	\$13,000 00
1838.	1,988,235 29	791 36	.....	1,989,026 55	.....	.....	.....	.....	.....	64,580 14	.....	2,079,147 07
1839.	.....	.....	.....	.....	.....	.....	.....	.....	.....	25,928 30	.....	880,926 30
1840.	250,000 00	.....	\$25,000 00	275,000 00	\$100,000 00	.....	.....	.....	.....	4,022 70	.....	716,388 14
1841.	306,519 82	.....	31,879 82	.....	455,000 00	.....	.....	.....	.....	.....	.....	822,452 59
1842.	810,376 62	.....	.....	196,376 62	.....	.....	.....	.....	.....	.....	.....	209,978 08
1843.	186,243 56	10,000 00	.....	196,243 56	.....	.....	.....	.....	.....	.....	.....	207,586 52
1844.	186,000 00	3,000 00	.....	189,000 00	.....	.....	.....	.....	.....	.....	.....	75,484 17
1845.	55,000 00	.....	.....	55,000 00	.....	.....	.....	.....	.....	.....	.....	115,182 60
1846.	91,000 00	.....	.....	91,000 00	.....	.....	.....	.....	.....	.....	.....	386,185 17
1847.	.....	.....	.....	.....	.....	\$213,129 97	.....	.....	.....	.....	.....	457,195 98
1848.	.....	.....	.....	.....	.....	213,129 97	.....	.....	.....	.....	.....	1,902,946 73
1849.	.....	.....	.....	.....	.....	989,500 00	.....	.....	.....	.....	.....	340,884 85
1850.	.....	.....	.....	.....	.....	177,572 31	.....	.....	.....	.....	.....	889,343 71
1851.	.....	.....	.....	.....	.....	187,103 61	.....	.....	.....	.....	.....	891,745 29
1852.	.....	.....	.....	.....	.....	186,243 62	.....	.....	.....	.....	.....	457,074 32
1853.	.....	.....	.....	.....	.....	187,103 61	.....	.....	.....	.....	.....	256,813 45
1854.	.....	.....	.....	.....	.....	187,103 61	.....	.....	.....	.....	.....	221,478 85
1855.	.....	.....	.....	.....	.....	158,736 27	.....	.....	.....	.....	.....	238,867 14
1856.	.....	.....	.....	.....	.....	172,148 81	.....	.....	.....	.....	.....	829,805 79
1857.	.....	.....	.....	.....	.....	157,295 61	.....	.....	.....	.....	.....	181,894 36
1858.	.....	.....	.....	.....	.....	159,296 88	.....	.....	.....	.....	.....	498,972 37
1859.	.....	.....	.....	.....	.....	693,199 05	.....	.....	.....	.....	.....	2,047,105 95
1860.	.....	.....	.....	.....	.....	142,831 61	.....	.....	.....	.....	.....	68,132 68
1861.	.....	.....	.....	.....	.....	292,594 52	.....	.....	.....	.....	.....	157,804 52
1862.	.....	.....	.....	.....	.....	24,895 34	.....	.....	.....	.....	.....	71,263 60
1863.	.....	.....	.....	.....	.....	1,992,510 00	.....	.....	.....	.....	.....	91,411 80
1864.	.....	.....	.....	.....	.....	27,483 23	.....	.....	.....	.....	.....	90,345 70
1865.	.....	.....	.....	.....	.....	22,490 00	.....	.....	.....	.....	.....	48,494 70
1866.	.....	.....	.....	.....	.....	95,065 00	.....	.....	.....	.....	.....	181,271 87
1867.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	255,122 65
1868.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

No. 70—(Continued).
GENESEE VALLEY CANAL.

YEARS.	DEFICIENCIES.		PAID.					Total.
	Paid by the General Fund.	Paid by the Erie and Champlain canals.	Principal of loans.	Temporary loans.	Interest on loans.	Surplus to Erie and Champlain Canals.	Canal Commissioners and Superintendent of Public Works.	
1877.....	\$147 06	.....	\$22,371 86	\$22,518 92
1878.....	100,000 00	.....	229,161 20	229,161 20
1879.....	102,662 74	.....	794,163 61	895,522 61
1880.....	126,062 76	.....	1,151,653 97	1,263,828 90
1881.....	171,478 22	.....	612,700 50	1,862,687 45
1882.....	\$123,370 26	.....	.....	.....	188,968 85	.....	170,667 75	1,167,171 27
1883.....	178,773 56	.....	.....	.....	198,130 75	.....	232,108 67	1,376,758 40
1884.....	190,509 98	.....	.....	.....	205,201 27	.....	35,311 25	1,418,685 54
1885.....	196,794 74	.....	.....	.....	204,126 59	.....	39,828 58	1,494,098 17
1886.....	201,874 58	.....	.....	.....	213,129 97	.....	10,441 67	1,584,098 17
1887.....	204,022 19	.....	.....	.....	213,129 97	\$7,768 87	39,828 58	1,674,114 17
1888.....	213,129 97	.....	10,441 67	1,744,114 17
1889.....	189,123 88	.....	39,828 58	1,844,114 17
1890.....	187,103 61	6,442 78	39,828 58	1,944,114 17
1891.....	187,103 61	10,064 53	39,828 58	2,044,114 17
1892.....	187,103 61	.....	39,828 58	2,144,114 17
1893.....	187,103 61	.....	39,828 58	2,244,114 17
1894.....	187,103 61	.....	39,828 58	2,344,114 17
1895.....	187,103 61	.....	39,828 58	2,444,114 17
1896.....	187,103 61	.....	39,828 58	2,544,114 17
1897.....	187,103 61	.....	39,828 58	2,644,114 17
1898.....	187,103 61	.....	39,828 58	2,744,114 17
1899.....	187,103 61	.....	39,828 58	2,844,114 17
1900.....	187,103 61	.....	39,828 58	2,944,114 17
1901.....	187,103 61	.....	39,828 58	3,044,114 17
1902.....	187,103 61	.....	39,828 58	3,144,114 17
1903.....	187,103 61	.....	39,828 58	3,244,114 17
1904.....	187,103 61	.....	39,828 58	3,344,114 17
1905.....	187,103 61	.....	39,828 58	3,444,114 17
1906.....	187,103 61	.....	39,828 58	3,544,114 17
1907.....	187,103 61	.....	39,828 58	3,644,114 17
1908.....	187,103 61	.....	39,828 58	3,744,114 17
1909.....	187,103 61	.....	39,828 58	3,844,114 17
1910.....	187,103 61	.....	39,828 58	3,944,114 17
1911.....	187,103 61	.....	39,828 58	4,044,114 17
1912.....	187,103 61	.....	39,828 58	4,144,114 17
1913.....	187,103 61	.....	39,828 58	4,244,114 17
1914.....	187,103 61	.....	39,828 58	4,344,114 17
1915.....	187,103 61	.....	39,828 58	4,444,114 17
1916.....	187,103 61	.....	39,828 58	4,544,114 17
1917.....	187,103 61	.....	39,828 58	4,644,114 17
1918.....	187,103 61	.....	39,828 58	4,744,114 17
1919.....	187,103 61	.....	39,828 58	4,844,114 17
1920.....	187,103 61	.....	39,828 58	4,944,114 17
1921.....	187,103 61	.....	39,828 58	5,044,114 17
1922.....	187,103 61	.....	39,828 58	5,144,114 17
1923.....	187,103 61	.....	39,828 58	5,244,114 17
1924.....	187,103 61	.....	39,828 58	5,344,114 17
1925.....	187,103 61	.....	39,828 58	5,444,114 17
1926.....	187,103 61	.....	39,828 58	5,544,114 17
1927.....	187,103 61	.....	39,828 58	5,644,114 17
1928.....	187,103 61	.....	39,828 58	5,744,114 17
1929.....	187,103 61	.....	39,828 58	5,844,114 17
1930.....	187,103 61	.....	39,828 58	5,944,114 17
1931.....	187,103 61	.....	39,828 58	6,044,114 17
1932.....	187,103 61	.....	39,828 58	6,144,114 17
1933.....	187,103 61	.....	39,828 58	6,244,114 17
1934.....	187,103 61	.....	39,828 58	6,344,114 17
1935.....	187,103 61	.....	39,828 58	6,444,114 17
1936.....	187,103 61	.....	39,828 58	6,544,114 17
1937.....	187,103 61	.....	39,828 58	6,644,114 17
1938.....	187,103 61	.....	39,828 58	6,744,114 17
1939.....	187,103 61	.....	39,828 58	6,844,114 17
1940.....	187,103 61	.....	39,828 58	6,944,114 17
1941.....	187,103 61	.....	39,828 58	7,044,114 17
1942.....	187,103 61	.....	39,828 58	7,144,114 17
1943.....	187,103 61	.....	39,828 58	7,244,114 17
1944.....	187,103 61	.....	39,828 58	7,344,114 17
1945.....	187,103 61	.....	39,828 58	7,444,114 17
1946.....	187,103 61	.....	39,828 58	7,544,114 17
1947.....	187,103 61	.....	39,828 58	7,644,114 17
1948.....	187,103 61	.....	39,828 58	7,744,114 17
1949.....	187,103 61	.....	39,828 58	7,844,114 17
1950.....	187,103 61	.....	39,828 58	7,944,114 17
1951.....	187,103 61	.....	39,828 58	8,044,114 17
1952.....	187,103 61	.....	39,828 58	8,144,114 17
1953.....	187,103 61	.....	39,828 58	8,244,114 17
1954.....	187,103 61	.....	39,828 58	8,344,114 17
1955.....	187,103 61	.....	39,828 58	8,444,114 17
1956.....	187,103 61	.....	39,828 58	8,544,114 17
1957.....	187,103 61	.....	39,828 58	8,644,114 17
1958.....	187,103 61	.....	39,828 58	8,744,114 17
1959.....	187,103 61	.....	39,828 58	8,844,114 17
1960.....	187,103 61	.....	39,828 58	8,944,114 17
1961.....	187,103 61	.....	39,828 58	9,044,114 17
1962.....	187,103 61	.....	39,828 58	9,144,114 17
1963.....	187,103 61	.....	39,828 58	9,244,114 17
1964.....	187,103 61	.....	39,828 58	9,344,114 17
1965.....	187,103 61	.....	39,828 58	9,444,114 17
1966.....	187,103 61	.....	39,828 58	9,544,114 17
1967.....	187,103 61	.....	39,828 58	9,644,114 17
1968.....	187,103 61	.....	39,828 58	9,744,114 17
1969.....	187,103 61	.....	39,828 58	9,844,114 17
1970.....	187,103 61	.....	39,828 58	9,944,114 17
1971.....	187,103 61	.....	39,828 58	10,044,114 17
1972.....	187,103 61	.....	39,828 58	10,144,114 17
1973.....	187,103 61	.....	39,828 58	10,244,114 17
1974.....	187,103 61	.....	39,828 58	10,344,114 17
1975.....	187,103 61	.....	39,828 58	10,444,114 17
1976.....	187,103 61	.....	39,828 58	10,544,114 17
1977.....	187,103 61	.....	39,828 58	10,644,114 17
1978.....	187,103 61	.....	39,828 58	10,744,114 17
1979.....	187,103 61	.....	39,828 58	10,844,114 17
1980.....	187,103 61	.....	39,828 58	10,944,114 17
1981.....	187,103 61	.....	39,828 58	11,044,114 17
1982.....	187,103 61	.....	39,828 58	11,144,114 17
1983.....	187,103 61	.....	39,828 58	11,244,114 17
1984.....	187,103 61	.....	39,828 58	11,344,114 17
1985.....	187,103 61	.....	39,828 58	11,444,114 17
1986.....	187,103 61	.....	39,828 58	11,544,114 17
1987.....	187,103 61	.....	39,828 58	11,644,114 17
1988.....	187,103 61	.....	39,828 58	11,744,114 17
1989.....	187,103 61	.....	39,828 58	11,844,114 17
1990.....	187,103 61	.....	39,828 58	11,944,114 17
1991.....	187,103 61	.....	39,828 58	12,044,114 17
1992.....	187,103 61	.....	39,828 58	12,144,114 17
1993.....	187,103 61	.....	39,828 58	12,244,114 17
1994.....	187,103 61	.....	39,828 58	12,344,114 17
1995.....	187,103 61	.....	39,828 58	12,444,114 17
1996.....	187,103 61	.....	39,828 58	12,544,114 17
1997.....	187,103 61	.....	39,828 58	12,644,114 17
1998.....	187,103 61	.....	39,828 58	12,744,114 17
1999.....	187,103 61	.....	39,828 58	12,844,114 17
2000.....	187,103 61	.....	39,828 58	12,944,114 17

(No. 71.)

STATEMENT of the receipts and payments on account of the Oneida Lake canal, in each year, up to the 30th September, 1881, inclusive, viz.:

YEARS.	RECEIVED.				Total.	Deficiencies paid by Erie and Champlain canals.	PAID						
	Loans.	From Sinking Fund.	Tolls.	Miscellaneous.			Principal of loans.	Purchase of canal and feeder.	Interest on loans.	Superintendents.	Collectors.	Surplus to Erie and Champlain canals.	Can't Commission rs. of Public Works and miscellaneous.	Total.
1841.....	\$50,000 00		\$294 58		\$50,294 58	\$3,319 82	\$50,000 00	\$1,166 66	\$2,332 81	\$115 50			\$53,614 40
1842.....			471 85		471 85	7,857 41		2,500 00	5,554 15	275 11			8,329 24
1843.....			475 04		475 04	4,513 58		2,500 00	2,224 25	254 35			4,988 60
1844.....			683 67		683 67	3,758 19		2,500 00	1,619 86	350 00			4,469 56
1845.....			678 66		678 66	3,477 78		2,500 00	1,406 45	250 00			4,156 45
1846.....			604 41		604 41	20,235 19		2,500 00	18,149 50	250 10			20,199 60
1847.....		\$2,500 00	487 49		2,987 49	5,875 78		2,500 00	6,130 02	233 25			8,963 27
1848.....		2,500 00	671 89		3,171 89	4,144 17		2,500 00	1,866 05	230 01			4,016 06
1849.....		2,500 00	794 67		3,294 67	1,447 89		2,500 00	1,962 58	219 88			4,742 56
1850.....		45,250 00	2,513 19		47,763 19	2,734 98		2,500 00	4,719 20	725 46		\$15 88	51,428 57
1851.....		6,000 00	6,178 57		12,178 57	\$44,000 00		1,250 00	3,500 16	742 90			13,185 05
1852.....			7,765 05		7,765 05	6,000 00			5,403 06	822 13			13,185 05
1853.....			10,282 18		10,282 18	2,987 01			5,701 92	986 32			12,789 15
1854.....			9,862 11		9,862 11	2,171 83			11,872 83	1,057 01			20,791 94
1855.....			7,340 81		7,340 81				6,235 63	1,018 69			14,619 31
1856.....			8,639 04		8,639 04								
1857.....			4,849 24		4,849 24								
1858.....			1,285 32		1,285 32	3,631 21							
1859.....			701 41		701 41	5,024 46							
1860.....			290 31		290 31	4,916 97							
1861.....			218 86		218 86	4,842 41							
1862.....			121 83		121 83	2,682 33							
1863.....			45 21		45 21	3,102 39							
1864.....			5 00		5 00	5,072 87							
1865.....						7,793 21							
1866.....						4,160 72							
1867.....						7,089 79							
1868.....						22,603 20							
1869.....						22,603 20							
1870.....						198,496 00							
1871.....						56,965 15							

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PAID

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(No. 72.)
STATEMENT of receipts and payments on account of the Baldwinville canal to September 30, 1881, in each year.

YEARS.	RECEIVED.			PAID.					
	Tolls.	Miscellaneous.	Total.	Deficiencies paid by the Erie and Champlain canals.	Surplus tolls to Erie and Champlain canals.	Superintendents.	Collectors.	Miscellaneous.	Total.
1853.	\$472 06	.....	\$472 06	\$2,375 22	\$312 80	.....	\$159 46	.....	\$473 06
1854.	429 86	.....	429 86	2,871 66	.....	.....	432 70	.....	2,805 06
1855.	78 01	.....	78 01	2,871 08	.....	.....	875 00	\$350 00	2,947 66
1856.	73 02	.....	73 02	1,486 34	.....	.....	877 68	.....	800 04
1857.	32 81	.....	32 81	2,367 46	.....	.....	178 66	.....	1,510 15
1858.	14 13	.....	14 13	887 27	.....	.....	.....	.....	2,381 62
1859.	26 03	.....	26 03	.....	.....	.....	.....	.....	413 30
1860.	23 17	.....	23 17	1,047 03	23 17	.....	.....	.....	1,080 60
1861.	22 57	.....	22 57	1,628 84	.....	.....	.....	.....	23 17
1862.	31 63	.....	31 63	88 16	.....	.....	.....	.....	174 67
1863.	88 17	.....	88 17	927 85	.....	.....	.....	4,620 14	4,601 47
1864.	20 62	.....	20 62	499 00	.....	.....	.....	583 27	1,215 07
1865.	.....	.....	.....	2,046 68	.....	.....	.....	.....	499 00
1866.	.....	.....	.....	98 82	.....	.....	.....	489 34	93 32
1867.	.....	.....	.....	1,708 00	.....	.....	.....	1,708 00	1,708 00
1868.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1872.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1876.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879.	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880, 1881.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	\$1,261 48	\$21,281 36	\$22,542 84	\$17,312 87	\$335 77	\$23,005 10	\$1,523 42	\$14,371 30	\$39,855 71
			17,312 87						
			\$39,853 71						
			Deficiencies paid by the Erie and Champlain canals.						

(No. 73.)

STATEMENT of receipts and payments on account of the Oneida River improvement in each year, up to September 30, 1881, inclusive, viz.:

YEARS.	Loans.	Discount on loans.	RECEIVED.					Tolls.	Miscellaneous.	Total.
			Avails of loans.	From Erie and Champlain canals.	From Sinking Fund.					
1838	\$25,000 00		\$25,000 00							\$25,000 00
1840										
1841	25,000 00	\$2,350 00	22,750 00						\$119 76	22,869 76
1842	9,432 57		9,432 57							9,432 57
1843	1,843 56		1,843 56							1,843 56
1844	8,000 00		8,000 00							8,000 00
1845										
1846										
1847				\$50,000 00		\$3,670 89	\$118 22			53,789 11
1848						8,670 89	200 50	1,200 00		9,071 39
1849						12,938 89	230 71	1,500 00		14,669 60
1850						8,010 61	5,565 63			13,576 24
1851						8,010 61	18,409 56			26,420 17
1852						24,540 54	21,450 17			45,990 71
1853						8,010 61	31,275 36			39,285 97
1854						8,010 61	31,962 82			39,973 43
1855						8,010 61	24,044 94	1,443 75		33,509 30
1856						8,010 61	52,035 78			60,046 39
1857						8,010 61	15,758 42			13,769 03
1858						8,010 61	8,725 19			16,735 80
1859						8,010 61	2,044 64			10,055 25
1860						8,010 61	1,015 96			9,026 57
1861						4,896 53	919 63			5,816 16
1862						61,025 00	9,311 09			70,336 09
1863						8,383 67	4,389 07			12,772 74
1864							3,572 89	11,021 11		14,603 47
1865							2,480 87	5,041 02		7,521 89
1866							2,668 53	24,401 29		27,069 82
1867							3,186 06	266 11		3,452 17
1868							2,039 85	1,732 57		3,772 42
1869							1,686 46	32,189 79		33,876 25
1870							756 59	17,691 28		18,447 87
1871							724 61	38,392 68		39,117 29

No. 73 — (Continued).
ONEIDA RIVER IMPROVEMENT.

YEARS.	RECEIVED.						Total.
	Loans.	Discount on loans.	Avails of loans.	From Erie and Champlain canals.	From Sinking Fund.	Tolls.	Miscellaneous.
1872	\$450 00	\$60 00
1873	629 57	629 57
1874	476 47	476 47
1875	215 40	\$94 50
1876	290 36	290 36
1877	625 28	625 28
1878	300 08	300 08
1879	146 85	146 85
1880	298 72	298 72
1881	313 11	141 55
Total	\$68,276 13	\$2,250 00	\$67,026 13	\$20,000 00	\$114,504 46	\$216,488 30	\$135,235 82
Deficiencies paid by Erie and Champlain canals.	34,176 68
							\$587,431 38

No. 73 — (Continued).
ONEIDA RIVER IMPROVEMENT.

YEARS.	Deficiencies paid by Erie and Champlain canals.	PAID.					Total.
		Principal of loans.	Surplus to Erie and Champlain canals.	Interest on loans.	Canal Commissioners and Superintendent of Public Works.	Superintendents of repairs.	Miscellaneous.
1839	\$1,250 00			\$1,250 00	\$19,138 94		\$17,412 47
1840	2,245 43			2,245 06	21,680 06		24,071 56
1841	2,081 42			2,081 42	19,308 13		21,389 55
1842	3,204 29			3,204 29			3,204 29
1843	3,378 43			3,378 43	6,094 98		9,473 41
1844	3,568 94			3,568 94			3,568 94
1845	3,681 99			3,681 99			3,681 99
1846				3,670 89			3,670 89
1847			\$114 22	3,651 99	1,179 87		4,968 98
1848			200 50	3,670 89			3,670 89
1849			230 71	3,505 82	6,080 00		19,249 16
1850			5,160 95	3,010 61	8,727 87	\$394 67	17,283 61
1851			16,159 95	3,010 61	6,913 07	2,249 61	28,333 24
1852			22,775 17	3,010 61		1,765 87	28,090 96
1853			28,567 93	3,010 61		2,878 47	34,256 97
1854			28,945 55	3,010 61		2,878 47	35,003 53
1855			19,461 72	3,010 61	1,443 75	4,518 79	28,459 30
1856			28,554 05	3,010 61		2,481 73	32,046 39
1857			10,459 40	3,010 61	4,228 42	3,590 51	21,481 49
1858			927 92	3,010 61		2,797 37	6,735 80
1859			840 26	3,010 61		1,078 88	5,065 25
1860				2,982 96			5,842 50
1861	14,135 72	1,843 56	935 30	1,025 00	182 67		66,090 35
1862		50,000 00	797 06	2,982 96	15,054 30		10,577 73
1863		8,000 00		1,293 67	928 00	447 76	4,398 07
1864			4,394 07				14,583 47
1865			3,572 36		10,141 92		7,530 89
1866			1,392 74		4,633 33	1,067 06	2,400 20
1867			2,688 53		21,269 23		582 53

No. 73 — (Continued).
ONEIDA RIVER IMPROVEMENT.

YEARS.	PAID.							Total.
	Deficiencies paid by Erie and Champlain canals.	Principal of loans.	Surplus to Erie and Champlain canals.	Interest on loans.	Canal Commissioners and Superintendent of Public Works.	Superintendents of repairs.	Miscellaneous.	
1870.....	\$755 59	.....	\$16,809 87	.....	\$1,581 41	\$18,346 87
1871.....	724 61	.....	37,259 56	.....	1,083 06	39,117 23
1872.....	650 00	.....	.....	.....	.....	650 00
1873.....	639 57	.....	.....	.....	.....	639 57
1874.....	476 47	.....	.....	.....	.....	476 47
1875.....	215 40	.....	94 50	.....	.....	809 90
1876.....	230 36	.....	.....	.....	.....	230 36
1877.....	535 26	.....	.....	.....	.....	535 26
1878.....	800 08	.....	.....	.....	.....	800 08
1879.....	146 85	.....	.....	.....	.....	146 85
1880.....	269 72	.....	.....	.....	.....	269 72
1881.....	454 96	.....	.....	.....	.....	454 96
Total	\$34,176 62	\$69,376 13	\$187,523 41	\$65,838 99	\$232,997 88	\$25,005 50	\$7,239 42	\$587,431 33

(No. 74.)

THE CANALS, R. 30, 1881, INCLUSIVE.

.....	58 11	60,992 98	3,645,553 41
.....	73 16	72,371 22	4,439,872 81
.....	93 29	55,587 11	7,677,661 75
.....	96 73	81,283 22	10,854,493 12
.....	79 10	156,158 04	5,828,618 16
.....	96 78	118,033 32	7,819,129 26
.....	95 93	177,939 55	3,559,863 14
.....	97 67	99,394 79	7,100,484 00
.....	11 30	67,966 80	5,502,766 56
.....	30 85	150,308 61	5,987,388 99
.....	94 07	535,855 38	4,542,820 94
.....	56 88	235,654 47	5,088,135 70
.....	95 70	137,301 29	8,762,220 48
.....	96 35	128,204 06	6,042,208 73
.....	24 04	149,559 37	7,022,351 99
.....	17 70	149,026 26	5,108,309 02
.....	9 99	119,596 18	7,194,608 46
.....	99 92	285,274 55	6,463,267 84
.....	14 12	229,799 55	5,888,987 48
.....	95 30	297,983 39	8,261,654 05
.....	90 20	494,668 63	9,287,082 87
.....	16 39	512,836 37	9,711,963 14
.....	18 09	201,543 30	6,015,687 99
.....	93 22	198,576 00	2,984,256 33
.....	27 69	179,947 13	2,429,752 37
.....	98 76	150,475 50	2,479,327 66
.....	2 86	151,306 36	1,580,984 59
.....	12 87	122,941 02	1,588,707 30
.....	18 35	136,902 74	1,867,608 47
\$290,097 66	\$5,9 92	\$7,002,775 67	\$266,449,685 16

.. See No. 3	2,4	3,396,138 42
.. See No. 5		
.. See No. 7		
.. See No. 9	5	\$269,845,823 58
.. See No. 11		
.. See No. 13		\$3,396,138 42
.. See No. 17	1	
.. See No. 19	2	1,737 57
.. See No. 21		
.. See No. 23		\$3,397,875 99
.. See No. 29		
.. See No. 37		

\$3.3



INDEX.

	Page.
Report of the Auditor.....	3
Revenues and expenditures of the last fiscal year.....	3
Canal debt paying interest September 30, 1881.....	5
Debt after balance of sinking funds have been applied	5
Canal debt outstanding.....	5
Revenues, comparative statement	6
Of the canal debt sinking funds.....	7
Sinking fund, article 7, section 1	7
Sinking fund, article 7, section 3	7
Unavailable deposits	9
Receipts and expenditures on account of the canals, tabulated, showing for each canal:	
1. The income derived from tolls and other sources.	
2. Payments for collection, ordinary repairs and miscella- neous charges on the revenues.	
3. The surplus of revenue, or profit in operating.	
4. The deficiency of revenue, or loss in operating.	
5. Payments from proceeds of taxes, for extraordinary re- pairs, damages, awards and interest.	
6. Total payments from earnings and taxes.	
7. Income in excess of all taxes.	
8. Payments in excess of income.	
Deductions from foregoing table.....	11
Estimated receipts for year ending September 30, 1882.....	13
Proposed amendments of the Constitution	14
The business of 1881.....	19
Transportation rates	25
Conclusion.....	26

DOCUMENTS AND TABLES.

Nos.		
1,	Receipts and payments during the fiscal year.....	27
2, 8,	Sinking fund for the redemption of the canal debt.....	29
4, 5,	Sinking fund for the redemption of the debt for the enlargement and completion of the canals.....	30
6, 7,	Investment of premiums on loans	31
8, 9,	Fund to provide for extraordinary repairs, etc., of the canals....	31
10, 11,	Fund for the Albany basin.....	32
12, 13,	Taxes of 1866.....	32
14, 15,	Taxes of 1880.....	32
16, 17,	Fund for the enlargement of the Erie, Oswego and other canals, etc., 32,	33
18, 19,	Fund for the enlargement of the Champlain canal	33, 34
20, 21,	Fund for the reconstruction of Oneida Lake canal.....	34
22, 23,	Deposits of contractors to secure the performance of contracts for new work and extraordinary repairs	34
24, 25,	Fund of the Erie canal enlargement	34, 35
26, 27,	Erie and Champlain canal fund	35-37
28, 29,	Oswego canal fund.....	41, 42
30, 31,	Cayuga and Seneca canal fund	42
32, 33,	Chemung canal fund.....	48

Nos.		PAGE.
84, 85,	Chenango canal fund.....	48
86, 37,	Black River canal fund.....	43, 44
88, 39,	Genesee Valley canal fund.....	44
40, 41,	Crooked Lake canal fund.....	44, 45
42, 43,	Fund for the Oneida River improvement.....	45
44, 45,	Seneca River towing-path.....	45
46, 47,	Cayuga inlet.....	45
48,	Canal debt, when due, interest on, etc.....	46
49,	Canal funds, how deposited and invested, and to what they belong..	47
50,	Stocks purchased and canceled.....	50
51,	Operations of the sinking fund for the canal debt under article 7, section 1 of the Constitution.....	51
52,	Operations of the sinking fund for the canal debt under article 7, section 3 of the Constitution.....	54
53,	Operations of the sinking fund for the canal debt under article 7, section 12 of the Constitution.....	56
54,	Statement of taxes levied for canal purposes under the present Con- stitution.....	57
55,	Tolls received on the canals in 1880 and 1881.....	58
56,	Statement showing the tolls collected, expenses and percentage of collection, and the year in which the collection commenced on each lateral canal.....	59
57,	Statement showing the tolls collected, cost of repairs and collection, the percentage of the same, and the aggregate tonnage of the total movement on all the canals.....	60
58,	Receipts of tolls, expenses of collection and repairs, and surplus revenues from 1836 to 1881.....	61
59,	Progress of the canal debt, amount paid for interest and to the Canal Commissioners; also the surplus revenues from 1836 to 1881.....	62
60,	List of clerks in the Canal Department.....	64
61,	Statement of advances to superintendents of repairs; payments to repair contractors and expenditures by Canal Commissioners for ordinary repairs, 1854 to 1881,..... sheet table, between 64 and	65
62,	Payments to Canal Appraisers, etc.....	65
63,	Receipts and payments on account of Erie canal enlargement.....	66
64,	Receipts and payments on account of Oswego canal.....	70
65,	Receipts and payments on account of Cayuga and Seneca canal.....	74
66,	Receipts and payments on account of Chemung canal.....	78
67,	Receipts and payments on account of Crooked Lake canal.....	82
68,	Receipts and payments on account of Chenango canal.....	86
69,	Receipts and payments on account of Black River canal.....	90
70,	Receipts and payments on account of Genesee Valley canal.....	94
71,	Receipts and payments on account of Oneida Lake canal.....	98
72,	Receipts and payments on account of Baldwinsville canal.....	100
73,	Receipts and payments on account of Oneida River improvement.....	101
74,	Statement of all receipts and payments on account of the canal fund, sheet table	

ANNUAL REPORT
OF THE
SUPERINTENDENT
OF THE
BANK DEPARTMENT
OF THE
STATE OF NEW YORK.

TRANSMITTED TO THE LEGISLATURE JANUARY 3, 1882.

ALBANY:
WEED, PARSONS AND COMPANY, PRINTERS.
1882.

STATE OF NEW YORK.

No. 5.

IN ASSEMBLY,

JANUARY 3, 1882.

ANNUAL REPORT

OF THE SUPERINTENDENT OF THE BANK DEPARTMENT.

STATE OF NEW YORK:

BANK DEPARTMENT, }
ALBANY, November 29, 1881. }

To the Honorable the Speaker of the Assembly:

SIR — As required by law, I have the honor herewith to transmit to the Legislature the Annual Report of this Department in relation to incorporated banks, banking associations, individual bankers, and other moneyed corporations.

I am, very respectfully,

Your obedient servant,

A. B. HEPBURN,

Superintendent.

REPORT.

BANK DEPARTMENT, }
• ALBANY, November 29, 1881. }

To the Honorable the Legislature of the State of New York:

At the close of the last fiscal year, September 30, 1881, seventy-two banks of discount and deposit, organized under the laws of this State, were engaged in active business.

NEW BANKS.

During the year the following named banking associations were organized, viz.:

NAME.	Location.	Capital.
Mount Morris Bank.....	New York city.....	\$100,000 00
Baldwin's Bank.....	Penn Yan.....	50,000 00
Merchants' Bank.....	Buffalo.....	300,000 00
St. Lawrence County Bank.....	Canton.....	50,000 00
Deposit and Cheque Bank.....	New York city.....	100,000 00
The Rondout Bank.....	Rondout.....	800,000 00

The four first-named banks are now in operation. The Deposit and Cheque Bank has not as yet opened for the transaction of business. The First National Bank of Rondout, on the 12th day of October, 1880, changed from the National system to a State bank, under the name of the Rondout Bank. On October 18, 1880, the said bank changed back to the National system, resuming its former name. The object of this double change was to obtain a new charter under the National system, which would run for the ensuing twenty years, the original charter of the bank (for twenty years) being about to expire.

BANKS CLOSED.

The Rondout Bank, by conversion, as above stated.

REDUCTION OF CAPITAL.

During the year one banking association, doing business in the city of New York, reduced its capital from \$412,500 to \$200,000.

CONDITION OF THE BANKS.

Following is a summary of the quarterly reports of all of the banks for the days nearest the close of the last two fiscal years:

RESOURCES.	Condition, September 18, 1880.	Condition, September 24, 1881.
Loans and discounts, less due from directors	\$63,502,759	\$74,745,135
Due from directors	2,676,500	3,034,151
Overdrafts	89,868	105,011
Due from trust companies, State, National and private banks and brokers	7,734,352	8,587,787
Real estate	2,235,232	2,038,633
Bonds and mortgages	835,102	385,725
Stocks and bonds	3,478,213	3,950,568
Specie	5,231,764	5,293,929
United States legal tender notes and circulating notes of National banks	4,011,045	4,617,703
Cash items	10,056,225	10,082,059
Loss and expense account	218,523	345,549
Assets not included under either of the above heads	283,064	277,078
Add for cents	218	244
Total resources	\$99,850,735	\$113,463,572
LIABILITIES.		
Capital	\$18,738,200	\$19,025,700
Surplus fund	4,856,539	5,093,147
Undivided profits	3,201,641	3,838,028
Circulation	37,553	33,926
Due depositors on demand	61,789,773	73,717,130
Due to trust companies, State, National and private banks and brokers	9,376,025	7,589,383
Due individuals and corporations other than banks and depositors	457,370	877,694
Due Treasurer of the State of New York	732,272	756,887
Amount due not included under either of the above heads	654,552	534,530
Add for cents	130	127
Total liabilities	\$109,850,735	\$113,463,572

There are four more banks in operation than at the date of the last report. The net increase in capital during the year is \$287,500. Loans and discounts have increased \$11,242,376, profits and surplus, \$869,995, and deposits, \$13,921,357. The total increase in assets for the year is \$13,612,817. The total increase in assets during the past two years is \$26,770,390. The marked increase in the volume of business and the aggregate amount of assets of the State banks and their increased number during the year not only attest their prosperity but demonstrate the fact that banks organized under State authority have a future as prosperous and certain as National banks.

TRUST, LOAN AND MORTGAGE COMPANIES.

The number of institutions of this class is the same as at the date of my last report, viz.: Twelve; except the Manhattan Mortgage Company all are engaged in active business. Two new companies were chartered by the last Legislature, viz.: The Buffalo Loan, Trust and Safe Deposit Company and * The Metropolitan Trust Company of New York, neither

* The Metropolitan Trust Company of New York opened for business December 1, 1881.

of which have as yet actively entered upon business, but are rapidly perfecting arrangements to do so.

CONDITION OF THE TRUST, LOAN AND MORTGAGE COMPANIES.

The following summary shows the condition of the Trust, Loan and Mortgage Companies of the State on the first days of July, 1880 and 1881.

RESOURCES.	July 1, 1881.	July 1, 1880.
Bonds and mortgages	\$10,768,288 44	\$11,718,377 78
Stock investments	17,183,935 40	16,625,270 99
Loaned on collaterals	72,700,659 88	43,279,592 72
Loaned on personal securities, including bills purchased.	11,607,738 66	13,027,806 76
Real estate	5,110,198 65	4,195,335 39
Cash on deposit in banks or other moneyed institutions.	6,342,434 08	5,641,882 18
Cash on hand	50,590 79	45,164 40
Suspended loans on real estate	859,923 47	928,614 03
Other assets	1,265,144 24	1,252,073 21
Total resources	\$125,888,913 61	\$106,713,717 46
LIABILITIES.		
Capital stock paid in, in cash	\$11,500,000 83	\$11,351,875 83
Surplus fund	5,602,932 24	4,285,185 15
Undivided profits	2,357,559 52	2,367,292 37
Deposits in trust	61,821,484 16	42,501,114 71
General deposits	32,800,852 84	23,662,259 12
Debentures	4,638,050 00	3,300,050 00
Bonds outstanding	4,577,819 22	5,538,958 27
Other liabilities	2,518,368 23	2,711,031 38
Excess of assets over liabilities	671,856 57	780,050 63
Total liabilities	\$125,888,913 61	\$106,713,717 46
SUPPLEMENTARY.		
Debts guaranteed and liability thereon	\$4,316,450 00	\$7,250,950 00
Interest, commissions and profits received during the six months ending	2,654,923 01	2,520,842 81
Interest paid and credited to depositors during same period	982,683 97	785,018 42
Expenses during same period	333,617 82	295,425 01
Dividends on capital stock declared during six months ending	547,000 00	438,075 00
Amount of deposits made by order of court during six months ending	3,546,123 87	2,309,089 06
Total amount of deposits on which interest is allowed at this date	90,051,656 47	64,752,916 39

These institutions seem to supply a want in the financial system of the State, which prior to their organization was unsupplied. Nothing else could account for the exceptional prosperity attending them. While their number has remained the same, and their capital been increased less than \$150,000, their assets during the past two years have increased \$45,687,241.62. The savings bank report, to be submitted in February next, will show the condition of these institutions on January 1, 1882, or six months later.

CORPORATIONS FOR THE SAFE-KEEPING AND GUARANTEEING OF PERSONAL PROPERTY.

Number of institutions in operation—Ten, two of which organized during the year, viz.: The Lincoln Safe Deposit Co. and the Grand Union Safe Deposit Co., both located in New York city.

Condition July 1, 1881.

NAME.	Location.	Capital.
Bankers' Safe Deposit Company.....	New York city	\$100,000 00
Brooklyn City Safe Deposit Company.....	Brooklyn	100,000 00
Central Safe Deposit Company	New York city	33,600 00
Grand Union Safe Deposit Company.....	New York city	300,000 00
Lincoln Safe Deposit Company.....	New York city	300,000 00
Long Island Safe Deposit Company	Brooklyn	200,000 00
Mercantile Safe Deposit Company	New York city	300,000 00
Safe Deposit Company of New York	New York city	235,300 00
Safe Deposit Company of Rochester	Rochester	100,000 00
Stuyvesant Safe Deposit Company.....	New York city	200,000 00
		\$1,976,900 00

BUILDING, MUTUAL, LOAN AND ACCUMULATING FUND ASSOCIATIONS.

These institutions are required, annually, to report to this Department "in such form" and by such officers as the Superintendent shall direct. While apparently trustworthy information induces the conviction that nearly 200 of these associations are in existence, only thirteen reports were received by the Department last year. I have no authority to impose the expense of preparing and printing blank forms for reports upon these associations; and certainly I could not impose it upon the other institutions reporting to this Department, hence no forms are prepared. The reports received are very imperfect, and afford but slight knowledge of their condition or business. The Superintendent was required by the act of 1875 to make biennial examinations. By an amendment in 1878 it was provided: "It shall be the duty of said Superintendent, on the request in writing, signed by not less than five of the stockholders of such corporations," to examine, etc., thus it will be seen that while these associations are nominally under my supervision, I have no control over them whatever, not even to compel them to report. I therefore recommend that the law be so amended as to sever the relations of these associations to this Department, and that they be required to publish annual reports as provided in the act of 1851, and also file the same in the clerk's office of the respective counties where located. These associations are wholly local, affecting but a small radius, and the object of publicity will thus be better secured and information afforded those interested in a much simpler and more satisfactory manner than under present law.

BANK BILLS RETURNED AND BURNED.

During the year there were no notes issued by incorporated banks, banking associations, or individual bankers received at the Bank Department for redemption or burning.

The total circulation canceled during the year, by expiration of the

legal time for redemption, was \$26,371, of which amount \$13,192 were notes issued by banking associations organized under the general banking laws, and \$13,179 were unsecured notes issued by incorporated banks.

The total circulation of State banks outstanding September 30, 1881, was \$348,089; at the close of the previous year it was \$374,460.

The circulation outstanding September 30, 1881, was divided as follows, viz.: Secured, \$52,269; unsecured, \$295,820.

SECURITIES HELD IN TRUST.

On September 30, 1881, \$1,126,267.43 of securities were held in trust by the Superintendent, for banking associations, individual bankers and trust companies, and were divided as follows, viz.:

Bonds and mortgages.....	\$18,800 00
United States stocks.....	1,068,400 00
New York State stocks.....	9,900 00
Cash.....	29,167 43
	<hr/>
	\$1,126,267 43
	<hr/>

The net decrease in securities during the year was \$39,902.34.

Of the securities deposited with the Superintendent \$70,000 is held as a guaranty of good faith on the part of banking associations and individual bankers; \$61,612 is held as security for outstanding circulation, the time for the redemption of which has not expired; \$900,378.98 is held for trust companies. The remaining \$94,276.45 is held subject to the orders of its owners—\$60,000 being stocks released by the provisions of chapter 202, Laws of 1880; and \$1,000 is the property of the Rondout Bank, which was converted into a National bank. The balance, \$33,276.45, is a deposit for the redemption of circulating notes, the legal time for the redemption of which expired January 28, 1876, and since that date has been subject to order of its owner.

INDIVIDUAL BANKERS.

The law, as it now stands, fixes no amount of capital as a requisite in the organization of an individual bank, neither is the amount left in the discretion of the Superintendent. Such banks have been formed with a capital of \$5,000—the amount at the time of organization required to be deposited with the Department—and could now be organized with a capital of only \$1,000, that being the amount required to be deposited with the Superintendent as a guarantee of good faith.

The desirability of giving publicity to banking transactions, and affording the public every information as to the institutions with which they deal, renders the organization of such banks desirable in comparatively small places and with limited amount of capital. Still I think the Legislature should prescribe some limits, or else place the matter wholly within the discretion of the Superintendent. All statutes relating to the organization of such banks are vague and indefinite. The policy of the Legislature in this regard should be embodied in a simple and explicit statute.

PRIVATE BANKERS.

The remarkable increase in the number of private bankers and the volume of business transacted by them has attracted the attention of all financiers of late. A prominent financial journal is authority for the statement that the private banking interest in Canada has increased five-fold in the last five years, and adds that "from the wealth and character of the men engaged, the movement is no ephemeral one." The only statistics of the business of private banks in this State, is that furnished by them in their reports to the U. S. Commissioner of internal revenue. They are required to report their capital employed and their average daily deposits like organized banks. I asked the Commissioner for statistics upon this subject, but for reasons satisfactory to himself he declined to give it.

Competent persons estimate that the amount of capital employed by the private banking interest fully equals the amount invested in regular banks, both State and National.

There is one primal cause for this, whatever other influences may be contributory, and that is the very onerous taxation imposed upon banks during war times and which subsequent legislation has refused to mitigate.

True these private banks are taxed like regular banks upon their *reported* capital and deposits. But they neither make nor publish verified quarterly reports of their condition, nor are they subject to examination.

When money is offered them, instead of accepting it as a *deposit*, and issuing a certificate therefor, they receive it as a *loan* and give a demand note, and it does not appear in their daily balance of deposits. Instead of reporting capital at the amount they really employ, they report an insignificant amount or none at all, and excuse themselves on the ground that whatever money they put into the business appears in the daily balances and is taxed as deposits. The ways in which the law can be evaded are numerous (ingenuity always surpasses itself when attacking a tax law), and there is no system of reports or examinations, as in case of regular banks, to detect or deter.

The State has two duties which are imperative: First, to so adjust

the tax laws that banks shall bear their proper share of taxation and only their proper share; and second, to give her banks the benefits they are entitled to from having regularly organized, by compelling private banks to advertise themselves as "private banks" and do business as such.

They make no reports of the condition of their business, are not subject to examination, and are under no supervising authority whatever. They may possess all that is requisite to a safe banking business; they may *want* all that is requisite to a safe banking business. They should not be permitted to assume the credit that attaches to regularly organized banks, whose condition, verified, is published quarterly, where the bank is located and which are subject to this Department. The State does not allow an "individual banker," organizing under the law, to assume a corporate name, and certainly no discrimination should be made against an organized bank and in favor of a private bank.

Many of the private bankers at present conducting business under corporate titles, have appropriated the name by which certain banking associations heretofore under the supervision of the Bank Superintendent were known. The extent to which this deception is carried is shown by a list of the following corporate titles under which individuals are conducting a wholly private business:

Name.	Location.
*Addison Bank.....	Addison, Steuben Co.
Bank of Antwerp.....	Antwerp, Jefferson Co.
Arcade Bank	Arcade, Wyoming Co.
Bainbridge Bank.....	Bainbridge, Chenango Co.
Farmers' Bank.....	Batavia, Genesee Co.
Bank of Canisteo.....	Canisteo, Steuben Co.
Bank of Castile.....	Castile, Wyoming Co.
Bank of Clayton.....	Clayton, Jefferson Co.
Clinton Bank.....	Clinton, Oneida Co.
*Bank of Dansville	Dansville, Livingston Co.
Bank of Delhi.....	Delhi, Delaware Co.
Railway Bank	Delhi, Delaware Co.
Bank of De Ruyter.....	De Ruyter, Madison Co.
Bank of Ellicottville.....	Ellicottville, Cattaraugus Co.
*Chemung Canal Bank	Elmira, Chemung Co.
Farmers and Mechanics' Bank.....	Elmira, Chemung Co.
Forestville Bank	Forestville, Chautauqua Co.
Bank of Gowanda.....	Gowanda, Cattaraugus Co.
Bank of Hammondsport.....	Hammondsport, Steuben Co.
Herkimer Bank.....	Herkimer, Herkimer Co.
Exchange Bank.....	Holley, Orleans Co.
Miners' Bank..	Fredonia, Chautauqua Co.

*Indicates banks recently under the supervision of this Department, continuing private business under former corporate name.

Name.	Location.
Lockport Banking Association.....	Lockport, Niagara Co.
Jefferson Banking House.....	Jefferson, Schoharie Co.
Canastota Banking House.....	Canastota, Madison Co.
Bank of Richmondville.....	Richmondville, Schoharie Co.
Partridge Banking House.....	Seneca Falls, Seneca Co.
Exchange Bank.....	Westfield, Chautauqua Co.
The Juliand Bank.....	Greene, Chenango Co.
* S. D. Hungerford's Bank.....	Adams, Jefferson Co.
E. M. Johnston & Co.'s Bank.....	Afton, Chenango Co.
George W. Hallock Bank.....	Bath, Steuben Co.
S. C. Thomson & Co.'s Bank.....	Booneville, Oneida Co.
* Q. W. Wellington & Co.'s Bank..	Corning, Steuben Co.
* J. N. Hungerford's Bank.....	Corning, Steuben Co.
* H. J. Miner & Co.'s Bank ...	Dunkirk, Chautauqua Co.
John Hall & Co.'s Bank.....	Fort Ann, Washington Co.
Rodger & Co.'s Bank.....	Jordan, Onondaga Co.
Bingham Bros. Bank.....	Mount Morris, Livingston Co.
Wm. C. Bronson's Bank.....	Painted Post, Steuben Co.
Lyman Lyon's Banking House ...	Palmyra, Wayne Co.
* R. L. Ingersoll & Co.'s Bank.....	Pulaski, Oswego Co.
W. B. Rich's Bank.....	Spencerport, Monroe Co.
* T. O. Grannis & Co.'s Bank.....	Utica, Oneida Co.
A. D. Mather & Co.'s Bank.....	Utica, Oneida Co.
Bank of Hoyt & Lewis.....	Wellsville, Allegany Co.
Bank of Honeoye Falls.....	Honeoye Falls, Monroe Co.
Farmers & Mechanics' Bank.....	Hornellsville, Steuben Co.
Chemung Valley Bank.....	Horseheads, Chemung Co.
* Bank of Lima.....	Lima, Livingston Co.
Limestone Bank.....	Limestone, Cattaraugus Co.
Bank of Livonia.....	Livonia Station, Livingston Co.
Union Bank.....	Lyons, Wayne Co.
Nunda Bank.....	Nunda, Livingston Co.
Central Bank.....	Oneida, Madison Co.
* Smith's Bank.....	Perry, Wyoming Co.
Bank of Pike.....	Pike, Wyoming Co.
Sherman Exchange Bank.....	Sherman, Chautauqua Co.
Springville Bank.....	Springville, Erie Co.
* Delaware County Bank.....	Walton, Delaware Co.
Bank of Warsaw.....	Warsaw, Wyoming Co.
Schuyler County Bank.....	Watkins, Schuyler Co.
Watkins Exchange Bank.....	Watkins, Schuyler Co.
Bank of Wellsville.....	Wellsville, Allegany Co.
Central Bank.....	White Plains, Westchester Co.
Windsor Bank.....	Windsor, Broome Co.
Bank of Worcester..	Worcester, Otsego Co.
Farmers & Mechanics' Bank.....	Bath, Steuben Co.
Deposit Bank.....	Angola, Erie Co.
Cattaraugus Banking Co.....	Cattaraugus, Cattaraugus Co.
Lake Shore Banking Co.....	Dunkirk, Chautauqua Co.
Union Banking Co.....	Fredonia, Chautauqua Co.

* Indicates banks recently under the supervision of this Department, continuing private business under former corporate name.

Name.	Location.
Crane's Bank.....	Hornellsville, Steuben Co.
Griswold's Bank	Clyde, Wayne Co.
Corbin Banking Co.....	New York city, N. Y.

Each of the seventy-five names of banking institutions above mentioned is calculated to give the impression that they are regularly organized with capital stock or regularly organized as individual banks. The State owes it to the institutions she has chartered, as well as to her citizens, to distinguish the institutions she has chartered and which have assumed public functions and public responsibilities, from a business carried on under a common-law right and which is wholly private and secret.

Private bankers should be forbidden to use corporate names and required to add "private banker" or "private bankers" in their letter-heads, advertisements and signs, so the public may at once know that they are not *incorporated* banks nor regularly organized *individual banks*.

The public are entitled to know just the nature and character of the banks with which they are called upon to deal, and the Legislature should see to it that these institutions, in their dealings with the public, should state the *whole truth* with regard to themselves, to the end that no deception or injustice may be accomplished.

ORGANIZATION OF BANKS.

The general banking act of 1838 fixed the minimum capital of banking associations at \$100,000, with a qualification that, with the consent of the Superintendent, in places of less than 6,000 inhabitants, associations with \$50,000 capital might be formed. A subsequent amendment changed the limit of inhabitants to 30,000.

The condition of affairs in 1838, when these limitations were fixed, has so materially changed that it seems to me a change in the law should follow. The extension of railroads into every section, the existence of telegraph offices in almost every hamlet, have vastly increased the business and commercial facilities of the State and brought every locality into direct and speedy communication with great business centers. Banking keeps even pace with commerce, and has responded to the demands of every active business center, however small.

The correspondence of this Department shows that in very many localities private banks have been established solely because the business did not warrant the investment of so large a capital as \$50,000. I think the law should be so amended as to permit the organization of banking associations with a capital of \$25,000 in places of less than 15,000 inhabitants. So long as the State permits the organization of

individual banks with \$5,000 capital, and the existence of private banks with no capital at all, it certainly cannot be unsafe to adopt this modification.

My experience in the Department justifies the belief that such a modification would bring in under the State system many private banks now existing, and serve to strengthen and improve the banking system generally.

REVISION OF THE BANKING LAWS.

The commission to revise the laws relating to banks, banking and trust companies, consisting of William Dowd, David C. Van Cott and Willis S. Paine, have nearly completed their labors. The revision will be given to the printer presently and laid before you at the opening of the session.

The act creating said commission among other things enacts that at the time of making their report "they shall suggest to the Legislature such omissions, contradictions and other imperfections as may appear in the original text, with their recommendations for amendments, either by repeal or by supplementary or explanatory legislation, with their reasons for such recommendations."

In view of this provision I do not deem it advisable to further traverse the present condition of the banking laws.

Respectfully submitted,

A. B. HEPBURN,

Superintendent.

TABLES

ACCOMPANYING THE

ANNUAL REPORT OF THE SUPERINTENDENT OF THE
BANK DEPARTMENT FOR 1881.

TABLE No. 1.

Detailed statement of the securities held in trust by the Superintendent, for banking associations, individual bankers and trust companies, together with statement of circulation outstanding at the close of the fiscal year ending September 30, 1881.

	Bonds and mortgages.	UNITED STATES STOCKS.						N. Y. STATE STOCKS.		Cash.	Total.
		Five per cent. ex-tended at three cent.	Six per cent. ex-tended at three and one-half per cent.	Four per cent.	Four and one-half per cent.	Five per cent.	Six per cent.	Five per cent.	Six per cent.		
Deposited by banking associations and individual bankers as a guaranty of good faith.....	\$2,000 00	\$2,000 00	\$48,000 00	\$16,000 00	.....	\$2,000 00	.....	.....	.....	\$70,000 00
Deposited by banking associations and individual bankers for redemption of outstanding circulation.	12,400 00	6,000 00	.....	15,000 00	.....	\$3,900 00	\$25,312 00	61,612 00
Held for banking associations and individual bankers, such securities being subject to surrender upon order of the owners	\$18,800 00	4,000 00	.....	21,000 00	32,000 00	\$5,000 00	4,000 00	\$6,000 00	.....	3,476 45	94,276 45
Total securities held for banking associations and individual bankers, September 30, 1881.....	\$18,800 00	\$6,000 00	\$2,000 00	\$81,400 00	\$33,000 00	\$5,000 00	\$21,000 00	\$6,000 00	\$3,900 00	\$28,788 45	\$225,888 45
Trust companies having securities deposited with the Superintendent as required by chapter 324 of the Laws of 1874:
Buffalo Trust Company.....
Brooklyn Trust Company.....
Central Trust Company, New York city.....	50,000 00	.....	.....	.....	.....	.....	378 98	378 98
Central Loan and Trust Company, New York city.....
Mercantile Trust Company, New York city.....	100,000 00	.....	.....	.....	.....	.....	.....	.....
New York Life Insurance and Trust Company, New York city.....	200,000 00	.....	.....	.....	.....	.....	.....	.....
Trust and Deposit Company of Onondaga, Syracuse.....
Union Trust Company, New York city.....
United States Trust Company, New York city.....
Total securities held for banking associations, individual bankers and trust companies, September 30, 1881.....	\$18,800 00	\$106,000 00	\$52,000 00	\$431,400 00	\$253,000 00	\$5,000 00	\$221,000 00	\$6,000 00	\$3,900 00	\$29,167 43	\$1,126,267 43

Amount of secured circulation, September 30, 1880	\$65,461 00
Amount of secured circulation, September 30, 1881	52,269 00

Decrease during the year	<u>\$13,192 00</u>
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Amount of circulation unsecured, charged to incorporated banks, September 30, 1880	\$308,999 00
Amount of circulation unsecured, charged to incorporated banks, September 30, 1881	205,820 00

Decrease during the year	<u>\$13,179 00</u>
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Total securities held for banking associations and individual bankers, September 30, 1880	\$265,790 79
Total securities held for banking associations and individual bankers, September 30, 1881	225,888 45

Decrease during the year	<u>\$39,902 34</u>
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Increase and decrease during the fiscal year, in the several kinds of securities held for banking associations, individual bankers and trust companies:

	Increase.	Decrease.
United States five per cent stock, extended at three and one-half per cent	\$106,000 00	
United States six per cent stock, extended at three and one-half per cent	52,000 00	
United States four per cent stock	151,500 00	
United States four and one-half per cent stock	<u>135,000 00</u>	
United States five per cent stock		\$350,000 00
United States six per cent stock		121,000 00
New York State six per cent stock		5,000 00
Cash		<u>8,402 34</u>
Net decrease in securities		<u>\$39,902 34</u>

[Assem. Doc. No. 5.]

3

TABLE No. 2.

Banks doing business under the laws of the State, September 24, 1881, with the amount of circulation charged to and securities held for each on the 30th day of September, 1881, and not included in either of the tables referred to in the notes below.

NAME OF BANK.	Location.	Capital.	New York State six per cent stock.	UNITED STATES STOCKS.					Total.	Circulation.
				Five per cent stock extended at three and one-half per cent.	Six per cent stock extended at three and one-half per cent.	Four per cent.	Four and one-half per cent.	Six per cent.		
Albany County Bank.....	Albany	\$200,000 00	.....	.....	.....	\$1,000 00	\$1,000 00	.....	\$1,000 00	.....
America, Bank of.....	New York city.	3,000,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
Atlantic State Bank.....	Brooklyn.	300,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Attica, Bank of.....	Buffalo.	250,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
Baldwin's Bank of Penn Yan.	Penn Yan	50,000 00	.....	\$1,000 00	.....	.....	1,000 00	.....	1,000 00	.....
Baldwinsville State Bank.	Baldwinsville.	50,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
Batavia, Bank of.....	Batavia.	50,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Brooklyn Bank.....	Brooklyn.	800,000 00	.....	.....	.....	.....	1,000 00	.....	1,000 00	.....
Brooklyn, Bank of.....	Brooklyn.	800,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
Buffalo, Bank of.....	Buffalo.	300,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Cattaraugus Bank.....	Niagara Falls.	50,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
Central Bank of Westchester County Bank.....	White Plains	100,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Citizens' Bank.....	Waverly	50,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
City Bank of Rochester.....	Rochester	200,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
City Bank of Schenectady.....	Schenectady	100,000 00	.....	.....	.....	.....	1,000 00	.....	1,000 00	.....
Commerce, Bank of.....	Buffalo.	200,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Commercial Bank.....	Brooklyn.	100,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Corn Exchange Bank.....	New York city.	1,000,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Elevanth Ward Bank.....	New York city.	100,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Farmers' Bank.....	Fayetteville	50,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....
Fifth Avenue Bank.....	New York city.	100,000 00	.....	.....	.....	1,000 00	1,000 00	.....	1,000 00	.....

NAME OF BANK.	Location.	Capital.	New York State six per cent stock.	UNITED STATES STOCKS.					Total.	Circulation.
				Five per cent stock extended at three and one-half per cent.	Six per cent stock extended at three and one-half per cent.	Four per cent.	Four and one-half per cent.	Six per cent.		
St. Lawrence County Bank.....	Canton.....	\$50,000 00	.....	.....	\$1,000 00	.....	.....	.....	\$1,000 00	.....
Susquehanna Valley Bank*.....	Binghamton.....	100,000 00	.....	.....	.....	\$1,000 00	.....	.....	1,000 00	.....
Union Bank of Medina†.....	Medina.....	50,000 00	.....	.....	.....	1,000 00	.....	.....	1,000 00	.....
West Side Bank*.....	New York city.....	50,000 00	.....	.....	.....	.....	.....	.....	1,000 00	.....
White's Bank of Buffalo.....	Buffalo.....	200,000 00	.....	.....	.....	.....	\$1,000 00	.....	1,000 00	.....
Total.....	.....	\$19,025,700 00	\$2,000 00	\$2,000 00	\$2,000 00	\$45,000 00	\$21,000 00	\$2,000 00	\$77,000 00	\$5,500 00

* See Table No. 6.

† See Table No. 7.

Notes — 73 banks reported.

† Closing circulation account under section 4, chapter 475. See Table 3 or 4 for securities and circulation.

TABLE No. 3.

Closing banks that have made a final deposit of stocks for the redemption of their notes, the names of their redeeming agents, the amount of their securities and circulation September 30, 1881, and the time when the redemption of their notes will expire.

NAME OF BANK.	Location.	Redeeming Banks.	Location.	UNITED STATES STOCKS.		Total.	Circulation.	Expiration of time for redemption.
				Four per cent.	Six per cent.			
1. Henry D. Barto & Co.'s Bank.	Trumansburgh ..	First National Bank	Albany. . . .	\$400	.....	\$400	\$300	1882. 17 June
2. Chemical Bank	New York city ..	Chemical National Bank	New York city.	.....	\$15,000	15,000	10,964	1883. 25 Aug.
3. People's Bank of the city of New York	New York city ..	People's Bank of the city of New York ..	New York city.	8,000	.....	8,000	5,415	1885. 2 July
4. Onelda County Bank	Utica	American Exchange Nat. Bank	New York city.	4,000	.....	4,000	3,068	1885. 30 July
				\$12,400	\$15,000	\$27,400	\$19,777	

TABLE No. 4.

Closing banks that have made a final deposit of cash for the redemption of their notes, with the names of redeeming agents, the amount of cash held for, and amount of circulation charged to each, on the 30th day of September, 1881, and the expiration of time for redemption.

NAME OF BANK.	Location.	Names of Redeeming Banks.	Location	Amount of cash on deposit.	Circulation.	Expiration of time for redemption.
5. New York and Erie Bank	Buffalo ..	Merchants' National Bank ..	Albany	\$8,776 00	\$8,776 00	1881. November 6
6. Nassau Bank	New York city..	{ National Albany Exchange Bank .. { Nassau Bank ..	Albany	8,900 00	8,900 00	1883. July 11
7. Long Island Bank.....	Brooklyn	New York State National Bank. ..	Albany	6,434 00	6,434 00	1883 June 23
8. Union Bank.	Medina	{ National Park Bank	New York city. }	1,000 00	1,000 00	1886. July 16
9. City Bank.....	Oswego	{ National Albany Exchange Bank. { Albany City National Bank	Albany	5,211 00	5,235 00	July 24
10. Bank of Geneva.....	Geneva	New York State National Bank.....	Albany	4,991 00	4,991 00	1887. January 24
				\$25,312 00	\$25,387 00	

TABLE No. 5.

Closing banks that do not report to the Superintendent, and have not taken measures to close their circulation account, with their securities and circulation, September 30, 1881.

NAME OF BANK.	Location.	N. Y. State six per cent stocks.	Total.	Circulation.
Bank of Commerce.....	New York city	\$1,900 00	\$1,900 00	\$1,655 00

TABLE No. 6.

Banks that had, on October 1, 1881, balances of cash or securities standing to their credit on the books of the Department, not required by law.

NAME.	Location.	Amount.
Bank of America	New York city.....	\$4,000 00
Brooklyn Bank	Brooklyn	4,000 00
City Bank	Schenectady.....	4,000 00
Flushing and Queens Co. Bank.	Flushing.....	4,000 00
Fulton Bank	Brooklyn	4,000 00
Fifth Avenue Bank	New York city.....	4,000 00
Manufacturers & Traders' B'k.	Buffalo	4,000 00
Nassau Bank	New York city.....	4,000 00
North River Bank.....	New York city.....	4,000 00
People's Bank	New York city.....	4,000 00
Phoenix Bank.....	Phoenix.....	4,000 00
Randall Bank.....	Cortland.....	33,276 45
Rondout Bank.....	Rondout	1,000 00
Saratoga County Bank	Waterford.....	4,000 00
State Bank.....	Randolph	4,000 00
Susquehanna Valley Bank....	Binghamton.....	4,000 00
West Side Bank.....	New York city.....	4,000 00
		<hr/> \$94,276 45

TABLE No. 7.

Incorporated banks whose circulation is not secured and have not advertised their final redemption, together with the amount of the same on the 30th of September, 1881. The charters of these banks, excepting that of the Manhattan Company, have expired.

Chemung Canal Bank.....	\$13,506 00
Delaware and Hudson Canal Company	705 00
Livingston County Bank.....	9,300 00
Manhattan Company (see table No. 2).....	262,562 00
Onondaga County Bank	9,747 00
	<hr/> \$295,820 00

TABLE No. 8.

An alphabetical list of the banks, having circulation, mentioned in the preceding tables, with the names and locations of their respective redeeming agents.

[The numbers in the margin refer to banks that have advertised the final redemption of their notes, published in tables 3 and 4 preceding.]

	NAME OF BANK.	Redeeming Banks.	Location.
2	Chemical Bank	Chemical National Bank	New York.
	Chemung Canal Bank, Incorporated	Mercantile National Bank	New York.
9	City Bank of Oswego	Albany City National Bank	Albany.
	Commerce in New York, Bank of	National Bank of Commerce	New York.
	Del. and Hudson Can. Co., incorp'd		
10	Geneva, Bank of	Mechanics and Farmers' Bank	Albany.
1	Henry D. Barto & Co.'s Bank	First National Bank	Albany.
	Livingston County Bank, incorpor'd	New York State National Bank	Albany.
7	Long Island Bank	do do	Albany.
	Manhattan Company, Incorporated,	Manhattan Company	New York.
	Mechanics' Bank, Brooklyn	Mechanics' Bank	Brooklyn.
6	Nassau Bank, New York	National Albany Exchange Bank	Albany.
		Nassau Bank	New York.
5	New York and Erie Bank	Merchants' National Bank	Albany.
4	Oneida County Bank	American Exchange National Bank	New York.
	Onondaga County Bank, incorpor'd	New York State National Bank	Albany.
3	People's Bank, New York	People's Bank	New York.
8	Union Bank of Medina	Adams, Kimball & Moore	New York.

TABLE No. 9.

Banks whose notes were advertised subsequent to the passage of chapter 236, Laws of 1859, to be redeemed under the provisions of that act or of chapter 331, Laws of 1850, or of chapter 362, Laws of 1864, or of chapters 585 and 541, Laws of 1873, and the time for the redemption of which has expired.

NAMES OF BANKS.	Location.	When time for redemption expired.
Addison Bank	Addison	September 1, 1871
Albany, Bank of	Albany	December 12, 1867
Albany City Bank, Incorporated	Albany	June 12, 1877
Albany Exchange Bank	Albany	September 14, 1872
Albion, Bank of	Albion	May 17, 1878
Alonzo Wood & Co.'s Bank	Elbridge	January 11, 1878
America, Bank of, Incorporated	New York	March 12, 1874
America, Bank of	New York	March 12, 1874
American Exchange Bank	New York	June 20, 1871
Amsterdam, Bank of	Amsterdam	January 18, 1874
Artisans' Bank	New York	December 5, 1867
Atlantic Bank, Incorporated	Brooklyn	April 4, 1876
Atlantic Bank	New York	October 29, 1872
Attica, Bank of	Buffalo	June 28, 1873
Auburn, Bank of	Auburn	March 25, 1874
Auburn, Bank of, Incorporated	Auburn	June 16, 1877
Auburn City Bank	Auburn	August 26, 1873
Auburn Exchange Bank	Auburn	February 20, 1874
Ballston Spa Bank	Ballston	May 24, 1873
Bank of the State of New York, incorpor'd	New York	March 18, 1890
Bath, Bank of	Bath	April 18, 1874
Bellingham Bank	Brooklyn	June 1, 1873
Binghamton, Bank of	Binghamton	March 27, 1873
Black River Bank	Watertown	February 24, 1874
Bowery Bank	New York	March 11, 1869
Briggs' Bank	Clyde	April 20, 1873
Broadway Bank	New York	January 22, 1880
Brookport Exchange Bank	Brookport	May 7, 1868
Brooklyn Bank	Brooklyn	March 80, 1877

[Assem. Doc. No. 5.]

TABLE No. 9 — (Continued.)

NAMES OF BANKS.	Location.	When time for redemption expired.
Brooklyn Bank, incorporated	Brooklyn	May 1, 1880
Broome County Bank, incorporated	Binghamton	June 10, 1870
Broome County Bank	Binghamton	August 6, 1875
Buffalo City Bank	Buffalo	December 18, 1873
Bull's Head Bank	New York	December 18, 1875
Burnet Bank	Syracuse	January 11, 1873
Butchers and Drovers' Bank	New York	December 24, 1872
Butchers and Drovers' Bank, incorporated	New York	May 20, 1877
Cambridge Valley Bank	North White Creek	November 15, 1872
Canajoharie Bank	Canajoharie	October 9, 1874
Canandaigua Bank of	Canandaigua	October 30, 1873
Canastota Bank	Canastota	February 7, 1874
Canton Bank of	Canton	December 30, 1873
Capitol Bank of the	Albany	December 14, 1867
Cataract Bank	Lockport	November 15, 1867
Catskill Bank of	Catskill	March 15, 1877
Cayuga County Bank, incorporated	Auburn	March 9, 1874
Cayuga County Bank	Auburn	March 9, 1874
Cayuga Lake Bank of	Painted Post	June 12, 1877
Cazenovia Bank of	Cazenovia	February 6, 1873
Central Bank	Brooklyn	October 31, 1877
Central Bank	Cherry Valley	August 22, 1873
Central Bank, incorporated	Cherry Valley	September 27, 1875
Central Bank	Troy	June 7, 1873
Central City Bank (formerly Crouse Bank)	Syracuse	October 20, 1873
Central New York Bank of	Utica	March 31, 1868
Chatham Bank	New York	April 28, 1872
Chautauqua County Bank	Jamesstown	November 5, 1872
Chautauqua County Bank, incorporated	Jamesstown	August 1, 1875
Chemical Manufacturing Co.'s Bank, incor.	New York	August 10, 1879
Chemung Bank of	Elmira	February 21, 1878
Chenango Bank of	Norwich	April 5, 1875
Chester Bank	Chester	April 16, 1873
Chittenango Bank	Chittenango	June 14, 1873
Citizens' Bank	Fulton	September 15, 1872
Citizens' Bank	New York	April 23, 1872
City Bank	Brooklyn	November 9, 1874
City Bank	Poughkeepsie	October 14, 1874
City Bank, incorporated	New York	July 19, 1875
Clinton Bank	Buffalo	May 17, 1871
Cohoes Bank of	Cohoes	July 16, 1878
Columbia Bank	Chatham Four Corners	March 2, 1873
Commercial Bank	Albany	January 27, 1878
Commercial Bank	Clyde	April 16, 1873
Commercial Bank	Glen's Falls	March 8, 1873
Commercial Bank	Rochester	May 12, 1874
Commercial Bank	Saratoga Springs	October 29, 1873
Commercial Bank	Troy	December 21, 1870
Commercial Bank	Whitehall	April 22, 1873
Commerce Bank of Putnam county	Carmel	April 3, 1873
Commonwealth Bank of the	New York	June 21, 1872
Continental Bank	New York	May 6, 1879
Cooperstown Bank of	Cooperstown	May 3, 1877
Corn Exchange Bank	New York	March 23, 1874
Corning Bank of	Corning	June 2, 1866
Coxsackie Bank of	Coxsackie	November 7, 1872
Croton River Bank	Southeast	February 1, 1872
Cuba Bank	Cuba	August 15, 1876
Cuyler's Bank	Palmyra	May 24, 1873
Danville Bank	Danville	August 7, 1873
Delaware Bank	Delhi	February 19, 1876
Deposit Bank	Deposit	July 29, 1874
Dover Plains Bank	Dover	November 8, 1872
East River Bank	New York	April 23, 1872
Elmira Bank	Elmira	September 5, 1872
Exchange Bank	Lockport	November 1, 1875
E. S. Rich's Bank of Exchange	Buffalo	April 23, 1873
Falkkill Bank	Poughkeepsie	April 24, 1873
Farmers' Bank	Amsterdam	January 18, 1874
Farmers' Bank	Hudson	November 9, 1872
Farmers' Bank	Lansingburgh	August 19, 1871
Farmers' Bank	Troy	December 12, 1872
Farmers' Bank, incorporated	Troy	September 20, 1878
Farmers' Bank of Attica	Batavia	August 18, 1873
Farmers' Bank of Saratoga county	Crecent	January 24, 1866
Farmers' Bank, Washington county	Fort Edward	September 17, 1873

TABLE No. 9—(Continued).

NAMES OF BANKS.	Location.	When time for redemption expired.
Farmers and Citizens' Bank, Long Island...	Brooklyn	November 1, 1873
Farmers and Drivers' Bank...	Somers	March 2, 1875
Farmers and Manufacturers' Bank	Poughkeepsie	October 22, 1874
Farmers and Manufacturers' Bank, incorp.	Poughkeepsie	October 22, 1874
Farmers and Mechanics' Bank of Genesee	Buffalo	February 20, 1874
Farmers and Mechanics' Bank	Rochester	May 16, 1873
Fayetteville, Bank of	Fayetteville	September 12, 1873
Fishkill, Bank of	Fishkill	June 9, 1874
Flour City Bank	Rochester	April 19, 1873
Fort Edward, Bank of	Fort Edward	January 18, 1874
Fort Plain Bank	Fort Plain	August 9, 1873
Fort Stanwix Bank	Rome	November 16, 1873
Frankfort Bank	Frankfort	March 12, 1873
Fredonia Bank	Fredonia	August 10, 1873
Frontier Bank	Potsdam	February 10, 1874
Fulton Bank	New York	October 7, 1875
Fulton County Bank	Gloversville	March 8, 1873
Genesee, Bank of, Incorporated.	Batavia	October 13, 1865
Genesee, Bank of	Batavia	January 28, 1873
Genesee County Bank	Le Roy	August 11, 1873
Genesee River Bank	Mount Morris	November 17, 1873
Genesee Valley Bank	Genesee	January 13, 1874
Geo. Washington Bank	Corning	December 28, 1880
Glen's Falls Bank	Glen's Falls	October 13, 1872
Goshen Bank	Goshen	December 31, 1879
Greenwich Bank	New York	October 30, 1879
Greenwich Bank, Incorporated.	New York	August 1, 1880
Grocers' Bank	New York	January 15, 1873
Hampden Bank	North Castle	June 27, 1873
Hamilton Bank	Hamilton	July 25, 1873
Hanover Bank	New York	February 28, 1876
Havana Bank	Havana	June 7, 1873
Herkimer County Bank	Little Falls	October 10, 1874
Herkimer County Bank, Incorporated.	Little Falls	April 4, 1878
H. G. Hotchkiss & Co.'s Bank.	Lyons	June 13, 1880
Highland Bank	Newburgh	April 18, 1873
Highland Bank, Incorporated.	Newburgh	April 18, 1873
H. J. Messenger's Bank	Cortland	February 12, 1874
H. J. Miner's Bank of Utica	Fredonia	March 11, 1867
H. J. Miner & Co.'s Bank	Dunkirk	February 11, 1875
Hollister's Bank	Buffalo	May 2, 1865
Hollis, White & Co.'s Bank	Niagara Falls	September 11, 1867
Hornellsville, Bank of	Hornellsville	May 23, 1865
Hope Bank	Albany	April 6, 1877
Hudson River Bank	Hudson	March 9, 1873
Hudson River Bank, Incorporated	Hudson	August 29, 1875
Huguenot Bank	New Paltz	November 8, 1873
Hungerford's Bank	Adams	May 19, 1874
Iion Bank	Iion	March 10, 1874
Importers and Traders' Bank	New York	June 10, 1871
Interior, Bank of the	Albany	September 11, 1861
International Bank	Buffalo	August 15, 1873
Iron Bank	Plattsburg	June 1, 1873
Irving Bank	New York	October 29, 1873
J. A. Clark & Co.'s Bank	Pulaski	May 1, 1873
Jamestown Bank	Jamestown	May 11, 1861
Jefferson County Bank	Watertown	November 20, 1874
Jefferson County Bank, Incorporated.	Watertown	July 23, 1877
J. N. Hungerford's Bank	Corning	June 3, 1873
J. N. Westfall & Co.'s Bank	Jordan	June 10, 1874
J. T. Raplee's Bank	Penn Yan	December 24, 1873
Joshua Pratt & Co.'s Bank	Sherburne	March 20, 1874
Judson Bank	Ogdensburg	June 19, 1873
J. W. Rumsey & Co.'s Bank	Tarrytown	December 12, 1867
Kent, Bank of	Ludingtonville	March 5, 1873
Kinderhook, Bank of	Kinderhook	October 6, 1872
Kingston Bank, Incorporated	Kingston	February 21, 1879
Knickbocker Bank	New York	July 6, 1867
Lake Bank	Skaneateles	January 24, 1873
Lake Mahopac Bank	Mahopac	February 29, 1866
Lake Ontario Bank	Oswego	October 16, 1873
Lake Shore Bank	Dunkirk	February 8, 1874
Lansingburgh, Bank of	Lansingburgh	May 1, 1873
Lansingburgh, Bank of, Incorporated.	Lansingburgh	May 1, 1873
Leather Manufacturers' Bank, Incorporated	New York	July 22, 1870
Leonardsville Bank	Leonardsville	July 26, 1873
Lima, Bank of	Lima	December 13, 1873

TABLE No. 9—(Continued).

NAMES OF BANKS.	Location.	When time for redemption expired.
Lincoln Bank	Clinton	October 20, 1872
Lockport City Bank	Lockport	June 2, 1875
Long Island Bank, Incorporated	Brooklyn	July 17, 1879
Lowville, Bank of	Lowville	January 21, 1875
Luther Wright's Bank	Oswego	May 23, 1865
Lyons Bank	Lyons	May 24, 1875
Madison County Bank, Incorporated	Cazenovia	April 2, 1868
Malone, Bank of	Malone	April 9, 1874
Manufacturers' Bank	N. Y. (form'ly Brooklyn)	March 22, 1873
Manufacturers' Bank	Troy	October 7, 1871
Manufacturers and Merchants' Bank	New York	September 16, 1878
Manufacturers and Traders' Bank	Buffalo	May 1, 1874
Marine Bank	Buffalo	October 23, 1873
Marine Bank	Oswego	October 6, 1872
Marine Bank	New York	May 23, 1871
Market Bank	New York	April 23, 1872
Market Bank	Troy	January 31, 1872
Mechanics' Bank	New York	September 7, 1878
Mechanics' Bank, Incorporated	New York	December 14, 1877
Mechanics' Bank	Syracuse	November 19, 1872
Mechanics' Banking Association	New York	April 6, 1871
Mechanics and Farmers' Bank	Albany	December 23, 1873
Mechanics and Farmers' Bank, Incorp	Albany	December 23, 1873
Mechanics and Traders' Bank	New York	October 12, 1874
Mechanics and Traders' Bank, Incorp	New York	October 12, 1874
Medina Bank	Medina	January 12, 1868
Mercantile Bank	New York	April 14, 1872
Mercantile Bank	Plattsburgh	June 23, 1872
Merchants' Bank	Albany	September 15, 1872
Merchants' Bank	Poughkeepsie	June 23, 1873
Merchants' Bank	Syracuse	January 29, 1873
Merchants' Bank	Westfield	January 11, 1873
Merchants' Bank, Incorporated	New York	December 17, 1869
Merchants' Bank	New York	October 8, 1871
Merchants' Bank of Erie County	Lancaster	April 30, 1870
Merchants' Exchange Bank	New York	October 9, 1872
Merchants' Exchange Bank, Incorporated	New York	March 9, 1871
Merchants and Farmers' Bank	Ithaca	October 31, 1872
Merchants and Mechanics' Bank	Troy	June 29, 1872
Merchants and Mechanics' Bank, Incorp	Troy	June 29, 1872
Metropolitan Bank	New York	March 14, 1873
Middletown Bank	Middletown	October 27, 1874
Mohawk Bank	Schenectady	May 22, 1873
Mohawk Bank, Incorporated	Schenectady	July 17, 1875
Mohawk River Bank	Fonda	November 5, 1874
Mohawk Valley Bank	Mohawk	April 25, 1874
Monroe Bank of Rochester	Cuba	December 21, 1865
Monroe County Bank	Rochester	September 11, 1873
Montgomery County Bank	Johnstown	December 16, 1873
Mutual Bank	Troy	January 8, 1874
Nassau Bank	Brooklyn	May 24, 1874
National Bank, Incorporated	New York	June 8, 1871
National Bank of Albany	Albany	December 18, 1867
National Bank	New York	April 23, 1873
Newark, Bank of	Newark	November 11, 1874
Newburgh, Bank of, Incorporated	Newburgh	June 4, 1875
New York, Bank of	New York	April 25, 1872
New York, Bank of, Incorporated	New York	April 27, 1872
Newburgh, Bank of	Newburgh	May 3, 1873
Newport, Bank of	Newport	March 13, 1873
New York County Bank	New York	September 22, 1872
New York Dry Dock Company, Incorp	New York	July 21, 1879
New York Exchange Bank	New York	June 7, 1871
New York State Bank	Albany	December 23, 1873
New York State Bank, Incorporated	Albany	December 23, 1873
Niagara County Bank	Lockport	June 14, 1873
North America, Bank of	New York	March 24, 1873
North River Bank	New York	December 31, 1872
Norwich, Bank of	Norwich	July 9, 1873
Ocean Bank	New York	April 23, 1872
Ogdensburgh Bank, Incorporated	Ogdensburgh	July 22, 1875
Old Saratoga, Bank of	Schuylerville	October 19, 1872
Oliver Lee & Co.'s Bank	Buffalo	June 20, 1865
Oneida Bank, Incorporated	Utica	June 10, 1873
Oneida Central Bank	Rome	October 1, 1873
Oneida Valley Bank	Oneida	May 5, 1874
Onondaga Bank	Syracuse	January 3, 1867

TABLE No. 9 — (Continued).

NAMES OF BANKS.	Location.	When time for redemption expired.
Ontario, Bank of.....	Canandaigua.....	February 8, 1874
O. Paddock & Co.'s Bank.....	Watertown.....	February 16, 1875
Orange County, Bank of.....	Goshen.....	November 26, 1879
Orange County, Bank of, incorporated.....	Goshen.....	December 6, 1875
Orangetown, Bank of.....	Orangetown.....	October 26, 1872
Oriental Bank.....	New York.....	April 9, 1876
Orleans County Bank.....	Albion.....	May 14, 1873
Oswegatchie Bank.....	Ogdensburg.....	July 15, 1873
Owego River Bank.....	Fulton.....	July 6, 1872
Otego, Bank of.....	Otego.....	August 26, 1879
Otego County Bank.....	Cooperstown.....	July 15, 1874
Otego County Bank, incorporated.....	Cooperstown.....	June 26, 1879
Owego, Bank of, incorporated.....	Owego.....	May 8, 1874
Pacific Bank.....	New York.....	May 1, 1879
Palisade Bank.....	Yonkers.....	April 9, 1874
Park Bank.....	New York.....	June 11, 1872
Pawling, Bank of.....	Pawling.....	November 26, 1872
Perrin Bank.....	Rochester.....	May 6, 1876
Phoenix Bank.....	New York.....	April 25, 1872
Phoenix Bank, incorporated.....	New York.....	April 26, 1872
Port Byron, Bank of.....	Port Byron.....	March 1, 1873
Port Jervis, Bank of.....	Port Jervis.....	May 12, 1874
Poughkeepsie, Bank of.....	Poughkeepsie.....	September 19, 1874
Poughkeepsie, Bank of, incorporated.....	Poughkeepsie.....	September 19, 1874
Powell Bank.....	Newburgh.....	November 2, 1866
Pres't. Directors and Co. of the Ontario B'k.	Utica.....	December 7, 1866
P. R. Westfall's Bank.....	Lyons.....	January 1, 1875
Pulaski Bank.....	Pulaski.....	July 20, 1869
Putnam Valley Bank.....	Putnam Valley.....	May 24, 1865
Q. W. Wellington & Co.'s Bank.....	Corning.....	June 8, 1873
Quasale Bank.....	Newburgh.....	March 25, 1874
Randall Bank.....	Cortland.....	January 23, 1876
Rensselaer County Bank.....	Lansingburgh.....	July 18, 1873
Republic, Bank of the.....	New York.....	July 18, 1879
Rhinebeck, Bank of.....	Rhinebeck.....	August 21, 1872
R. M. Goddard & Co.'s Bank.....	Canton.....	March 14, 1872
R. L. Ingersoll & Co.'s Bank.....	Pulaski.....	July 16, 1873
Rochester Bank.....	Rochester.....	May 6, 1873
Rochester City Bank, incorporated.....	Rochester.....	March 24, 1881
Rochester Exchange Bank.....	Rochester.....	February 11, 1880
Rockland County Bank.....	Nyack.....	April 4, 1873
Rome, Bank of, incorporated.....	Rome.....	June 6, 1873
Rome Exchange Bank.....	Rome.....	September 23, 1872
Rondout, Bank of.....	Rondout.....	February 23, 1881
St. Nicholas Bank.....	New York.....	June 26, 1871
Salem, Bank of.....	Salem.....	September 12, 1872
Salina, Bank of, incorporated.....	Syracuse.....	February 11, 1874
Salt Springs Bank.....	Syracuse.....	January 8, 1873
Saratoga County Bank.....	Waterford.....	April 30, 1873
Saratoga County Bank, incorporated.....	Waterford.....	June 30, 1879
Saratoga Springs, Bank of.....	Saratoga Springs.....	January 20, 1879
Saugerties Bank.....	Saugerties.....	November 9, 1874
Schenectady Bank.....	Schenectady.....	October 26, 1874
Schenectady Bank, incorporated.....	Schenectady.....	March 17, 1873
Schoharie County Bank.....	Schoharie.....	October 12, 1874
Seneca County Bank, incorporated.....	Waterloo.....	July 14, 1875
Seneca Falls, Bank of.....	Seneca Falls.....	March 30, 1873
Setauket Bank.....	Setauket.....	January 2, 1873
Seventh Ward Bank, incorporated.....	New York.....	August 29, 1870
Shoe and Leather Bank.....	New York.....	October 16, 1872
Silver Creek, Bank of.....	Silver Creek.....	September 19, 1877
Sing Sing, Bank of.....	Sing Sing.....	March 1, 1867
Smith's Bank of Perry.....	Mount Morris.....	November 8, 1879
Spraker Bank.....	Canajoharie.....	June 24, 1874
State Bank.....	Saugerties.....	March 16, 1866
State Bank.....	Troy.....	September 13, 1872
State of New York Bank.....	Kingston.....	June 19, 1873
Steuben County Bank, incorporated.....	Bath.....	June 30, 1874
Steuben County Bank.....	Bath.....	January 16, 1873
Stirling Bank.....	Pine Plains.....	August 15, 1872
Suffolk County Bank.....	Sag Harbor.....	April 30, 1873
Susquehanna Valley Bank.....	Binghamton.....	January 8, 1881
Syracuse, Bank of.....	Syracuse.....	February 11, 1874
Syracuse City Bank.....	Syracuse.....	January 23, 1874
Tanners' Bank.....	Catskill.....	June 21, 1873
Tanners' Bank, incorporated.....	Catskill.....	June 21, 1873

TABLE No. 9—(Continued).

NAMES OF BANKS.	Location.	When time for redemption expired.	
Tioga Bank of.....	Owego.....	May	8, 1874
T. O. Grannis & Co.'s Bank.....	Utica.....	February	9, 1876
Tompkins County Bank, Incorporated.....	Ithaca.....	November	14, 1875
Traders' Bank (formerly Manufacturers' Bank and Eagle Bank).....	Rochester.....	October	19, 1874
Tradesmen's Bank.....	New York.....	February	6, 1873
Tradesmen's Bank, Incorporated.....	New York.....	July	23, 1875
Troy Bank of.....	Troy.....	December	12, 1872
Troy Bank of, Incorporated.....	Troy.....	September	20, 1873
Troy City Bank, Incorporated.....	Troy.....	February	20, 1873
Trumansburgh Bank of.....	Trumansburgh.....	June	14, 1877
Ulster Bank of.....	Saugerties.....	October	20, 1872
Ulster County Bank.....	Kingston.....	October	27, 1874
Ulster County Bank, Incorporated.....	Kingston.....	October	27, 1874
Unadilla Bank.....	Unadilla.....	May	12, 1874
Union Bank, Incorporated.....	New York.....	June	15, 1870
Union Bank.....	Albany.....	March	30, 1872
Union Bank.....	Kinderhook.....	October	15, 1873
Union Bank.....	New York.....	February	28, 1874
Union Bank.....	Rochester.....	November	25, 1873
Union Bank, Sullivan County.....	Monticello.....	July	18, 1873
Union Bank.....	Troy.....	April	30, 1874
Union Bank.....	Watertown.....	October	15, 1873
Utica Bank of.....	Utica.....	April	25, 1874
Utica and Branch, Bank of, Incorporated.....	Utica.....	June	20, 1875
Utica City Bank.....	Utica.....	May	15, 1874
Vernon Bank of.....	Vernon.....	May	16, 1874
Walkkill Bank.....	Middletown.....	March	25, 1873
Washington County Bank.....	Greenwich.....	November	19, 1872
Watertown Bank of.....	Watertown.....	September	19, 1874
Watertown Bank and Loan Company.....	Watertown.....	March	14, 1874
Waterville Bank of.....	Waterville.....	April	8, 1873
Waverly Bank.....	Waverly.....	February	26, 1873
Weedsport Bank.....	Weedsport.....	August	6, 1873
Westchester County Bank.....	Peekskill.....	November	12, 1873
Westchester County Bank, Incorporated.....	Peekskill.....	April	25, 1880
Western Bank.....	Lockport.....	June	20, 1885
Westfield Bank of.....	Westfield.....	April	15, 1871
West Troy Bank of.....	West Troy.....	February	16, 1872
West Winfield Bank of.....	West Winfield.....	May	23, 1873
Whitehall Bank of.....	Whitehall.....	May	12, 1874
Whitehall Bank of, Incorporated.....	Whitehall.....	April	22, 1878
White's Bank.....	Buffalo.....	January	29, 1874
Whitestown Bank of.....	Whitestown.....	October	25, 1873
William Williams Bank.....	Hastings.....	June	7, 1870
Williamsburgh City Bank.....	Williamsburgh.....	November	2, 1873
Wooster Sherman's Bank.....	New York.....	January	2, 1874
Worthington Bank.....	Cooperstown.....	October	1, 1872
Wyoming County Bank.....	Warsaw.....	June	25, 1872
Yonkers Bank of.....	Yonkers.....	April	11, 1878

TABLE No. 10.

Amount with the State treasury as shown by the account of expenses incurred for banks and trust companies.

Balance in State treasury October 1, 1880, as shown by the report of the Superintendent January 5, 1881.....	\$3,639 05
There was paid into the State treasury, from October 1, 1880, to October 1, 1881.....	4,229 00
	<hr/> \$7,868 05

During the same period the following sums were drawn from the State treasury :

For salary of Superintendent.....	\$5,000 00
For miscellaneous.....	920 00
	<hr/> 5,920 00

Leaving a balance in the State treasury October 1, 1881, of..... \$1,948 05

Supplementary statement of receipts and disbursements during the fiscal year, the same not having passed through the State treasury.

RECEIPTS.

Balance of cash on hand October 1, 1880.	\$52 45
For regular annual examinations of trust companies....	898 00
For regular annual examinations of safe deposit companies	121 51
For special examinations of State banks... ..	80 00
For special examinations of savings banks.....	60 00
For certified copies of papers on file in this Department,	79 00
	<hr/> \$1,290 96

DISBURSEMENTS.

For services and expenses of examiners during examination of trust companies.....	\$898 00
For services and expenses of examiners during examination of safe deposit companies	121 51
For services and expenses of examiners during examination of State banks.....	182 25
For services and expenses of examiners during examination of savings banks.....	52 50
	<hr/> 1,204 26
Balance of cash on hand October 1, 1881.....	<u>\$86 70</u>

TABLE No. 11.

DETAILED STATEMENT

OF THE

CONDITION OF THE BANKS OF THE STATE OF NEW
YORK ON SATURDAY, DECEMBER 11, 1880, MARCH 12,
1881, JUNE 18, 1881, AND SEPTEMBER 24, 1881.

[Assem. Doc. No 5.]

5

ALBANY COUNTY BANK — Albany.

BENJAMIN W. WOOSTER, *President.*

(Organized 1871.)

JOHN TEMPLETON, *Cashier.*

RESOURCES	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$635,458	\$693,403	\$641,496	\$645,493
Due from directors	15,964	33,733	35,733	37,933
Overdrafts	199	1,121	1,291	19
Due from trust companies, State, national and private banks and brokers ..	67,822	45,733	52,633	53,014
Real estate	36,856	40,561	40,561	40,561
Bonds and mortgages	9,275	9,275	9,275	9,175
Stocks and bonds	1,000	1,000	1,000	1,000
Specie	6,951	4,011	6,829	8,347
United States legal tender notes and circulating notes of national banks ..	13,764	17,366	24,806	28,714
Cash items	13,801	17,935	9,950	19,059
Loss and expense account	4,490	2,231	5,197	2,073
Add for cents	8	4	3	4
Total resources	\$810,583	\$866,373	\$828,774	\$840,393
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	60,989	51,745	61,092	57,640
Due depositors on demand	485,850	570,050	514,019	522,763
Due to trust companies, State, national and private banks and brokers ..	64,243	44,577	53,661	59,988
Add for cents	1	1	2	1
Total liabilities	\$810,583	\$866,373	\$828,774	\$840,393

BANK OF AMERICA — New York City.

WILLIAM L. JENKINS, President.

(Organized 1862.)

ROBERT JAFFRAY, Cashier.

RESOURCES.				
Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 16, 1881.	Statement of condition, Sept. 24, 1881.	
\$8,451,496	\$8,972,482	\$10,245,432	\$8,462,747	
286,000	113,000	264,000	459,000	
819,225	157,059	391,681	189,818	
159,000	159,000	159,000	159,000	
5,000	5,000	5,000	5,000	
1,658,731	1,630,727	1,385,665	1,448,472	
874,724	299,549	472,818	518,441	
8,284,638	2,766,185	4,627,293	1,812,876	
80,662	11,946	81,812	12,361	
708	708	81,812	12,361	
3	2	3	2	
\$13,965,187	\$14,115,668	\$17,581,920	\$13,067,737	
Total resources.....				
LIABILITIES.				
Capital.....	\$3,000,000	\$3,000,000	\$3,000,000	
Surplus fund.....	1,518,671	1,530,914	1,534,455	
Undivided profits.....	162,298	66,100	210,781	
Circulation.....	1,095	1,085	1,085	
Due depositors on demand.....	7,114,569	7,116,969	10,360,780	
Due to trust companies, State, national and private banks and brokers.....	2,073,509	2,269,416	2,357,754	
Due individuals and corporations other than banks and depositors.....	51,338	45,477	33,610	
Amount due, not included in either of the above heads.....	43,704	85,705	83,451	
Add for cents.....	3	2	4	
Total liabilities.....	\$13,965,187	\$14,115,668	\$17,581,920	\$13,067,737

ALBANY COUNTY BANK — Albany.

BENJAMIN W. WOOSTER, *President.*

(Organized 1871.)

JOHN TEMPLETON, *Cashier.*

RESOURCES	Statement of condition, Dec. 11, 1880.	Statement of condition, March 15, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$985,458	\$693,403	\$641,496	\$645,498
Due from directors	15,964	33,783	35,733	37,983
Overdrafts	199	1,121	1,291	19
Due from trust companies, State, national and private banks and brokers	67,822	45,733	52,633	53,014
Real estate	36,856	40,561	40,561	40,561
Bonds and mortgages	9,275	9,275	9,275	9,175
Stocks and bonds	1,000	1,000	1,000	1,000
Specie	6,951	4,011	6,829	8,347
United States legal tender notes and circulating notes of national banks	13,764	17,866	24,806	28,714
Cash items	18,801	17,935	9,950	19,059
Loss and expense account	4,490	2,231	5,197	2,073
Add for cents	8	4	3	4
Total resources	\$810,583	\$866,373	\$828,774	\$840,392
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	60,989	51,745	61,092	57,640
Due depositors on demand	435,850	570,050	514,019	522,763
Due to trust companies, State, national and private banks and brokers	64,243	44,377	53,661	59,988
Add for cents	1	1	2	1
Total liabilities	\$810,583	\$866,373	\$828,774	\$840,392

BANK OF AMERICA — New York City. (Organized 1862.)

WILLIAM L. JENKINS, *President.*

ROBERT JAFFRAY, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 16, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$8,451,496	\$8,972,482	\$10,245,432	\$8,462,747
Due from directors	286,000	113,000	264,000	459,000
Overdrafts .....	...	10	218	520
Due from trust companies, State, national and private banks and brokers	319,225	157,059	391,681	189,818
Real estate	159,000	159,000	159,000	159,000
Stocks and bonds	5,000	5,000	5,000	5,000
Specie	1,658,731	1,630,727	1,385,665	1,448,472
United States legal tender notes and circulating notes of national banks	374,724	289,549	472,318	518,441
Cash items	3,284,638	2,766,185	4,627,293	1,812,876
Loss and expense account.....	30,662	11,946	31,812	12,361
Assets not included in either of the above heads	708	2	3	2
Add for cents.....	3	2	3	2
Total resources.....	\$13,965,187	\$14,115,668	\$17,581,920	\$13,067,737

LIABILITIES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 16, 1881.	Statement of condition, Sept. 24, 1881.
Capital	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000
Surplus fund	1,518,671	1,530,914	1,534,455	1,549,589
Undivided profits	162,298	66,100	210,781	99,702
Circulation	1,085	1,085	1,085	1,085
Due depositors on demand.....	7,114,569	7,116,969	10,360,780	6,542,187
Due to trust companies, State, national and private banks and brokers	2,073,509	2,269,416	2,357,754	1,714,703
Due individuals and corporations other than banks and depositors.....	51,338	45,477	33,610	32,028
Amount due, not included in either of the above heads	43,704	85,705	83,451	128,407
Add for cents.....	3	2	4	2
Total liabilities.....	\$13,965,187	\$14,115,668	\$17,581,920	\$13,067,737

ATLANTIC STATE BANK — Brooklyn.

GEORGE S. PUFFER, *President.*

(Organized 1872.)

OLIVER M. DENTON, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$760,918	\$862,090	\$737,935	\$806,042
Due from directors.....	41,104	42,106	83,760	41,879
Due from trust companies, State, national and private banks and brokers ..	102,876	65,485	249,753	49,139
Real estate.....	25,000	25,000	25,000	25,000
Stocks and bonds ..	9,086	9,086	9,086	9,012
Specie	8,083	8,097	10,931	7,583
United States legal tender notes and circulating notes of national banks....	33,639	33,564	46,652	41,680
Cash items.....	1,936	1,147	1,204	2,763
Loss and expense account.....	6,075	11,688	2,226	8,402
Add for cents ..	3	2	2	3
Total resources.....	\$986,720	\$1,050,265	\$1,116,599	\$991,003
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	100,000	100,000	100,000	100,000
Undivided profits.....	16,217	29,815	19,948	88,422
Due depositors on demand	656,589	705,197	757,851	652,510
Due to trust companies, State, national and private banks and brokers.....	16,664	15,202	38,739	5,070
Amount due, not included in either of the above heads.....	249	50	60	.....
Add for cents	1	1	1	1
Total liabilities.....	\$986,720	\$1,050,265	\$1,116,599	\$991,003

BANK OF ATTICA — Buffalo. (Organized 1860.)

G. BARRETT RICH, *President.*F. L. DANFORTH, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
	\$1,254,579 1,900 2,098 15,499 35,000 400 1,000 4,766 15,773 3,035 3,348 488 5	\$1,151,926 1,169 62,399 5,000 400 1,000 20,150 23,472 1,553 3,654 337 4	\$1,231,088 1,015 192,109 4,500 400 1,000 3,404 80,884 5,924 4,646 4	\$1,459,223 4,282 45,326 4,400 1,000 1,432 47,785 12,849 3,811 3
Loans and discounts less due from directors.....				
Due from directors.....				
Overdrafts.....				
Due from trust companies, State, national and private banks and brokers.....				
Real estate.....				
Bonds and mortgages.....				
Stocks and bonds.....				
Specie.....				
U. S. legal tender notes and circulating notes of national banks.....				
Cash items.....				
Loss and expense account.....				
Assets not included in either of the above heads.....				
Add for cents.....				
Total resources.....	\$1,337,391	\$1,271,064	\$1,464,974	\$1,579,610
LIABILITIES.				
Capital.....	\$250,000	\$250,000	\$250,000	\$250,000
Surplus fund.....	51,874	49,125	62,312	50,917
Undivided profits.....	19,988	14,450	19,160	21,934
Due depositors on demand.....	854,348	844,093	958,769	1,128,183
Due to trust companies, State, national and private banks and brokers.....	17,989	9,131	94,776	30,494
Due Treasurer of the State of New York.....	118,690	73,000	79,955	98,080
Amount due, not included in either of the above heads.....	25,000	31,263	.....	.....
Add for cents.....	2	2	2	2
Total liabilities.....	\$1,337,391	\$1,271,064	\$1,464,974	\$1,579,610

BALDWIN'S BANK OF PENN YAN.

MASON L. BALDWIN, President.

(Organized 1881.)

SILAS KINNE, Cashier.

RESOURCES.

	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$104,869	\$196,960
Due from directors.....	2,050	8,500
Overdrafts.....	1,993	426
Due from trust companies, State, national and private banks and brokers.....	7,741	11,060
Real estate.....	20,000	20,000
Stocks and bonds.....	1,000	1,081
Specie.....	1,432	1,138
U. S. legal tender notes and circulating notes of national banks.....	4,028	7,144
Cash items.....	821	188
Loss and expense account.....	873	1,400
Add for cents.....	2	4
Total resources.....	\$143,409	\$242,796

LIABILITIES.

Capital.....	.....	\$50,000	\$50,000
Undivided profits.....	.....	1,850	5,428
Due depositors on demand.....	.....	91,017	104,787
Due to trust companies, State, national and private banks and brokers.....	.....	540	230
Amount due not included in either of the above heads.....	.....	.....	22,350
Add for cents.....	.....	2	1
Total liabilities.....	.....	\$143,409	\$242,796

BALDWINVILLE STATE BANK — Baldwinville.

GEORGE HAWLEY, President.

(Organized 1875.)

S. S. QUIVEY, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$104,693	\$121,800	\$117,882	\$112,619
Due from directors.....	5,825	874	252	1,151
Due from trust companies, State, national and private banks and brokers.....	10,112	4,804	6,695	7,908
Stocks and bonds.....	6,000	6,000	6,000	6,000
Specie.....	179	145	279	878
United States legal tender notes and circulating notes of National banks.....	483	8,079	2,769	1,581
Cash items.....	1,169	41	1,119	29
Loss and expense account.....	126	808	.....	669
Assets not included in either of the above heads.....	1,000	1,000	1,000	1,000
Add for cents.....	2	2	1	2
Total resources.....	\$128,589	\$137,048	\$134,497	\$130,287
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	5,506	7,831	7,239	5,710
Due depositors on demand.....	72,173	78,851	77,258	74,161
Due to trust companies, State, national and private banks and brokers.....	909	965	.....	415
Add for cents.....	1	1	.....	1
Total liabilities.....	\$128,589	\$137,048	\$134,497	\$130,287

BANK OF BATAVIA — Batavia.

JEROME ROWAN, *President.*

(Organized 1876.)

HOLDEN T. MILLER, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$244,064	\$167,718	\$169,910	\$169,589
Due from directors	2,500	7,187	4,807	4,651
Overdrafts	2,090	816	245	409
Due from trust companies, State, national and private banks and brokers	30,046	62,212	51,047	38,912
Bonds and mortgages	300	8,550	5,550	5,850
Stocks and bonds	7,100	7,100	7,100	7,100
Specie	1,234	1,111	1,885	1,437
U. S. legal tender notes and circulating notes of national banks	3,107	4,398	5,509	2,448
Cash items	1,585	.....	103	74
Assets not included in either of the above heads	1	1,552	1,595	1,500
Add for cents	1	1	1	2
Total resources	\$291,977	\$255,635	\$247,252	\$231,472
LIABILITIES.				
Capital	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits	26,899	20,980	21,124	16,147
Due depositors on demand	214,206	183,600	175,187	164,804
Due to trust companies, State, national and private banks and brokers	870	1,054	941	1,020
Add for cents	2	1	.....	1
Total liabilities	\$291,977	\$255,635	\$247,252	\$231,472

BROOKLYN BANK — Brooklyn.

ELIAS LEWIS, Jr., President.

(Organized 1866.)

HENRY E. HUTCHINSON, Cashier.

[Assem. Doc. No. 5.]

RESOURCES.		Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....		\$883,965	\$943,275	\$1,085,882	\$1,098,740
Due from directors.....		8,159	18,150	24,100	18,770
Overdrafts.....		88	.....	.....	817
Due from trust companies, State, national and private banks and brokers ..		251,857	58,389	85,294	42,652
Real estate.....		1,960	2,784	2,715	2,679
Bonds and mortgages.....		10,000	10,000	10,000	10,000
Stocks and bonds.....		169,017	143,345	143,345	148,365
Specie.....		14,859	6,211	4,745	5,623
United States legal tender notes and circulating notes of national banks ..		86,193	72,345	94,218	101,105
Cash items.....		36,695	38,997	38,596	39,336
Loss and expense account.....		9,045	3,342	7,918	8,364
Add for cents.....		2	1	2	8
Total resources.....		\$1,451,840	\$1,295,039	\$1,446,815	\$1,465,954

LIABILITIES.		Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Capital.....		\$800,000	\$800,000	\$800,000	\$800,000
Surplus fund.....		81,859	71,298	68,031	68,024
Undivided profits.....		16,131	7,327	22,987	9,164
Due to depositors on demand.....		1,040,347	907,116	1,038,386	1,075,996
Due to trust companies, State, national and private banks and brokers ..		12,655	7,030	15,894	9,395
Amount due, not included in either of the above heads.....		847	2,167	2,064	2,373
Add for cents.....		1	1	3	2
Total liabilities.....		\$1,451,840	\$1,295,039	\$1,446,815	\$1,465,954

BANK OF BUFFALO — Buffalo. (Organized 1872.)

SHERMAN S. JEWETT, *President.*

WILLIAM C. CORNWELL, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$1,822,284	\$1,751,864	\$1,823,595	\$2,167,896
Overdrafts	265	652	847	523
Due from trust companies, State, national and private banks and brokers.	327,171	253,248	449,534	724,659
Real estate	30,000	30,000	30,000	30,000
Stocks and bonds	29,200	140,650	266,050	377,950
Specie	9,039	7,532	5,348	5,237
U. S. legal tender notes and circulating notes of national banks.	53,550	56,635	50,773	51,201
Cash items	17,408	10,552	4,940	6,983
Add for cents	2	3	3	3
Total resources	\$2,288,929	\$2,250,936	\$2,631,090	\$3,364,252
LIABILITIES.				
Capital	\$300,000	\$300,000	\$300,000	\$300,000
Undivided profits	112,653	112,846	139,485	118,813
Due depositors on demand	1,607,281	1,617,550	1,904,360	2,581,998
Due to trust companies, State, national and private banks and brokers	150,360	148,038	207,288	265,865
Due Treasurer of the State of New York	118,634	73,000	79,955	98,074
Add for cents	1	2	2	2
Total liabilities	\$2,288,929	\$2,250,936	\$2,631,090	\$3,364,252

CATARACT BANK — Niagara Falls.

STOUGHTON PETTEBONE, President.

(Organized 1877.)

FRANCIS R. DELANO, Cashier.

	RESOURCES.			
	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$132,871	\$153,217	\$160,587	\$187,383
Due from directors.....	.....	255	.....	185
Overdrafts.....	186	426	205	518
Due from trust companies, State, national and private banks and brokers.....	66,254	77,022	53,649	102,785
Real estate.....	18,000	18,000	18,000	18,000
Stocks and bonds.....	1,076	1,076	1,076	1,076
Specie.....	612	1,042	1,651	789
U. S. legal tender notes and circulating notes of national banks.....	7,880	10,131	9,929	19,619
Cash items.....	151	578	100	1,274
Loss and expense account.....	.....	891	.....	188
Assets not included in either of the above heads.....	3,000	8,000	8,000	8,000
Add for cents.....	2	8	2	4
Total resources.....	\$228,982	\$260,576	\$242,899	\$329,821
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	10,925	7,886	10,065	8,224
Due depositors on demand.....	157,209	200,762	180,325	269,527
Due to trust companies, State, national and private banks and brokers.....	5,797	1,687	2,508	2,069
Amount due, not included in either of the above heads.....	.....	240	.....	.....
Add for cents.....	1	1	1	1
Total liabilities.....	\$223,932	\$260,576	\$242,899	\$329,821

BANK OF BUFFALO — Buffalo.

SHERMAN S. JEWETT, *President.*

(Organized 1872.)

WILLIAM C. CORNWELL, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$1,322,294	\$1,751,664	\$1,823,595	\$2,167,896
Overdrafts	265	652	847	523
Due from trust companies, State, national and private banks and brokers	327,171	258,248	449,534	724,659
Real estate	30,000	30,000	30,000	30,000
Stocks and bonds	29,200	140,650	266,050	377,950
Specie	9,059	7,532	5,348	5,237
U. S. legal tender notes and circulating notes of national banks	53,550	56,635	50,773	51,201
Cash items	17,408	10,552	4,940	6,983
Add for cents	2	3	3	3
Total resources	\$2,288,929	\$2,250,936	\$2,631,090	\$3,364,252
LIABILITIES.				
Capital	\$300,000	\$300,000	\$300,000	\$300,000
Undivided profits	112,653	112,346	139,485	118,313
Due depositors on demand	1,607,281	1,617,550	1,904,860	2,581,998
Due to trust companies, State, national and private banks and brokers	150,860	148,038	207,288	265,865
Due Treasurer of the State of New York	118,634	73,000	79,955	98,074
Add for cents	1	2	2	2
Total liabilities	\$2,288,929	\$2,250,936	\$2,631,090	\$3,364,252

CATARACT BANK — Niagara Falls.

STOUGHTON PETTEBONE, *President.*

(Organized 1877.)

FRANCIS R. DELANO, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$132,371	\$153,217	\$160,587	\$187,383
Due from directors.....	.....	255	.....	185
Overdrafts.....	186	426	205	518
Due from trust companies, State, national and private banks and brokers.....	66,254	77,022	53,649	103,785
Real estate.....	18,000	18,000	18,000	18,000
Stocks and bonds.....	1,076	1,076	1,076	1,076
Specie.....	612	1,042	1,651	789
U. S. legal tender notes and circulating notes of national banks.....	7,330	10,131	9,929	19,619
Cash items.....	151	573	100	1,274
Loss and expense account.....	.....	831	.....	188
Assets not included in either of the above heads.....	8,000	8,000	8,000	8,000
Add for cents.....	2	8	2	4
Total resources.....	\$223,932	\$260,576	\$242,899	\$329,821
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	10,925	7,886	10,065	8,324
Due depositors on demand.....	157,209	200,762	180,325	269,527
Due to trust companies, State, national and private banks and brokers.....	5,797	1,687	2,508	2,069
Amount due, not included in either of the above heads.....	.....	240	.....	.....
Add for cents.....	1	1	1	1
Total liabilities.....	\$223,932	\$260,576	\$242,899	\$329,821

CENTRAL BANK OF WESTCHESTER COUNTY — White Plains.

WILLIAM H. ALBRO, *President.*

(Organized 1883.)

J. FRANKLIN PHILIPS, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$129,442	\$128,022	\$166,066	\$177,928
Due from directors.....	8,625	10,275	14,894	7,623
Due from trust companies, State, national and private banks and brokers.....	42,127	67,106	23,703	37,629
Real estate.....	15,000	14,000	14,000	13,000
Bonds and mortgages.....	20,500	20,500	20,500	20,500
Stocks and bonds.....	18,720	18,720	22,720	22,720
Specie.....	730	1,136	560	382
U. S. legal tender notes and circulating notes of national banks.....	8,593	19,053	14,873	13,333
Cash items.....	1,786	1,960	1,846	981
Loss and expense account.....	2,210	775	1,898	486
Assets not included in either of the above heads.....	1,500	1,000	1,000	1,000
Add for cents.....	1	2	2	2
Total resources.....	\$249,234	\$282,549	\$282,062	\$295,584
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund.....	2,638	1,545	1,497	1,067
Undivided profits.....	4,425	1,425	4,833	2,216
Due depositors on demand.....	133,183	162,520	174,597	186,946
Due to trust companies, State, national and private banks and brokers.....	8,986	17,058	1,634	5,653
Add for cents.....	2	1	1	2
Total liabilities.....	\$249,234	\$282,549	\$282,062	\$295,584

CITIZENS' BANK — Waverly.

J. T. SAWYER, President.

(Organized 1874.)

L. R. MANNING, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$95,438	\$108,000	\$80,467	\$76,813
Due from directors	3,300	1,000	500	.....
Overdrafts	2,384	1,450	2,401	457
Due from trust companies, State, national and private banks and brokers	34,060	27,171	67,240	104,183
Real estate	24,585	24,685	19,245	19,245
Bonds and mortgages	.....	.....	.....	5,000
Stocks and bonds	1,000	1,000	14,500	12,800
Specie	458	1,817	1,839	840
United States legal tender notes and circulating notes of national banks	2,716	4,112	2,823	6,401
Cash items	704	211	996	316
Loss and expense account	2,541	174	786	2,050
Assets not included in either of the above heads	749	739	701	792
Add for cents	4	4	3	3
Total resources	\$167,884	\$170,368	\$191,001	\$228,050
LIABILITIES.				
Capital	\$50,000	\$50,000	\$50,000	\$50,000
Surplus fund	.....	5,000	5,000	5,000
Undivided profits	13,113	5,105	6,800	6,699
Due depositors on demand	102,067	107,670	125,953	159,526
Due to trust companies, State, national and private banks and brokers	2,718	2,587	3,447	6,324
Add for cents	1	1	1	1
Total liabilities	\$167,884	\$170,368	\$191,001	\$228,050

CITY BANK OF ROCHESTER.

CHARLES E. UPTON, *President.*

(Organized 1872.)

HENRY BARNARD, *Cashier.*

	RESOURCES.			
	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$731,386	\$767,982	\$746,012	\$837,887
Due from directors	47,783	69,899	69,225	78,725
Overdrafts	1,020	4,395	2,033	1,435
Due from trust companies, State, national and private banks and brokers	116,058	58,710	64,310	82,984
Real-estate	41,937	56,158	53,674	54,566
Bonds and mortgages	83,645	17,695	21,135	20,463
Stocks and bonds	9,903	12,308	10,000	10,000
Specie	7,019	4,775	14,527	11,553
U. S. legal tender notes and circulating notes of national banks	29,174	25,597	30,687	28,600
Cash items	35,914	82,181	29,213	25,616
Loss and expense account	5,228	8,327	8,915	4,828
Assets not included in either of the above heads	1,819	1,819	2,897	1,819
Add for cents	4	5	8	4
Total resources	\$1,060,790	\$1,054,746	\$1,047,631	\$1,157,829
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits	24,729	8,411	17,160	12,898
Due depositors on demand	461,729	502,226	560,398	565,188
Due to trust companies, State, national and private banks and brokers	4,893	6,931	110,448	220,086
Due individuals and corporations other than banks and depositors .....	.....	159,275	.....	.....
Amount due not included in either of the above heads	369,438	177,902	159,629	159,655
Add for cents	1	1	1	2
Total liabilities	\$1,060,790	\$1,054,746	\$1,047,631	\$1,157,829

CITY BANK OF SCHENECTADY.

THOMAS W. MCCAMUS, *President.*

(Organized 1874.)

O. S. LUFFMAN, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$318,685	\$352,031	\$392,439	\$382,165
Due from directors.....	52,035	41,281	19,450	26,891
Overdrafts.....	4,107	309	669	2,550
Due from trust companies, State, national and private banks and brokers.....	54,019	66,890	69,879	57,725
Bonds and mortgages.....	580	580	580	580
Stocks and bonds.....	47,250	47,150	47,150	47,150
Specie.....	1,645	- 1,081	1,430	1,711
United States legal tender notes and circulating notes of national banks.....	9,608	16,026	14,377	11,220
Cash items.....	15,159	6,556	702	441
Loss and expense account.....	2,317	1,315	3,815	1,285
Assets not included in either of the above heads.....	2,500	2,500	2,500	2,500
Add for cents.....	2	2	3	3
Total resources.....	\$502,907	\$535,721	\$553,003	\$534,221
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund.....	15,000	15,000	15,000	15,000
Undivided profits.....	15,496	9,943	18,315	18,312
Due depositors on demand.....	362,239	403,964	416,206	397,113
Due to trust companies, State, national and private banks and brokers.....	10,104	5,668	2,557	6,530
Amount due, not included in either of the above heads.....	67	1,145	924	2,265
Add for cents.....	1	1	1	1
Total liabilities.....	\$502,907	\$535,721	\$553,003	\$534,221

BANK OF COMMERCE — Buffalo.

R. G. STEWART, *President.*

(Organized 1873.)

H. G. NOLTON, *Cashier.*

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
RESOURCES.				
Loans and discounts less due from directors.....	\$1,715,751	\$1,676,477	\$1,709,366	\$2,019,667
Overdrafts.....	2,435	1,068	1,303	1,523
Due from trust companies, State, national and private banks and brokers ..	322,348	298,704	387,918	492,237
Real estate	14,376	14,376	5,855	5,855
Bonds and mortgages.....	.....	.....	4,000	4,000
Stocks and bonds.....	16,000	16,000	16,000	16,000
Specie	32,894	32,009	20,294	34,285
U. S. legal tender notes and circulating notes of national banks.....	66,681	86,308	63,741	70,150
Cash items	6,422	1,500	8,190	7,524
Add for cents.....	3	8	2	2
Total resources	\$2,176,910	\$2,076,445	\$2,216,669	\$2,651,243
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	120,000	130,000	130,000	140,000
Undivided profits	39,888	27,469	53,759	34,045
Due depositors on demand.....	1,481,828	1,447,072	1,545,832	1,878,679
Due to trust companies, State, national and private banks and brokers.....	216,938	198,903	207,622	304,438
Due Treasurer of the State of New York	118,260	73,000	79,955	94,080
Add for cents.....	1	1	1	1
Total liabilities	\$2,176,910	\$2,076,445	\$2,216,669	\$2,651,243

COMMERCIAL BANK — Brooklyn.

THOMAS D. HUDSON, *President.*

(Organized 1888.)

JOHN J. VAIL, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1888.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$436,293	\$401,502	\$496,551	\$463,948
Due from directors.....	28,400	21,200	28,200	21,300
Overdrafts.....	423	548	417	301
Due from trust companies, State, national and private banks and brokers.....	17,339	85,873	8,263	11,789
Real estate.....	55,194	55,194	55,194	55,194
Stocks and bonds.....	18,900	18,900	18,900	18,420
Specie.....	3,252	4,040	4,143	4,380
U. S. legal tender notes and circulating notes of national banks.....	33,984	38,281	42,988	49,418
Cash items.....	27,640	21,053	29,588	24,404
Loss and expense account.....	5,635	2,990	4,823	2,565
Assets not included in either of the above heads.....	3,500	3,500	4,109	3,500
Add for cents.....	3	2	3	4
Total resources.....	\$625,563	\$603,082	\$688,065	\$655,173
LIABILITIES.				
Capital.....	\$108,000	\$108,000	\$108,000	\$108,000
Undivided profits.....	30,808	24,014	32,172	28,848
Due depositors on demand.....	451,237	450,452	527,233	482,445
Due to trust companies, State, national and private banks and brokers.....	.....	.....	300	348
Due to individuals and corporations other than banks and depositors.....	35,000	20,000	20,000	35,000
Amount due, not included in either of the above heads.....	517	615	359	531
Add for cents.....	1	1	1	1
Total liabilities.....	\$625,563	\$603,082	\$688,065	\$655,173

[Assem. Doc. No. 5.]

CORN EXCHANGE BANK — New York City

WILLIAM A. FALLS, *President.*

(Organized 1862.)

WILLIAM A. NASH, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$3,469,846	\$3,452,032	\$4,214,275	\$4,461,870
Due from directors	96,400	212,000	28,400	93,662
Overdrafts.....	123	332	53	88
Due from trust companies, State, national and private banks and brokers...	166,980	114,959	261,520	191,662
Real estate	112,162	112,162	112,254	112,254
Stocks and bonds	966	966	966	966
Specie	266,221	226,917	212,562	490,217
United States legal tender notes and circulating notes of national banks.....	89,950	50,198	91,825	45,871
Cash items.....	2,700,721	2,392,863	1,612,784	1,442,906
Loss and expense account	14,480	2,744	11,812	2,840
Add for cents.....	3	3	4	4
Total resources.....	\$6,917,353	\$6,564,676	\$6,546,405	\$6,841,790
LIABILITIES.				
Capital.....	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Surplus fund	747,408	750,500	750,500	752,000
Undivided profits	192,399	155,957	209,762	182,059
Circulation	4,606	4,606	4,606	4,606
Due depositors on demand	4,925,269	4,593,891	4,837,011	4,752,563
Due to trust companies, State, national and private banks and brokers	46,022	55,996	198,895	146,841
Amount due, not included in either of the above heads.....	1,145	4,225	630	3,720
Add for cents.....	3	1	1	1
Total liabilities	\$6,917,353	\$6,564,676	\$6,546,405	\$6,841,790

ELEVENTH WARD BANK — New York City.

GEORGE W. QUINTARD, *Vice-President.*

CHARLES E. BROWN, *Cashier.*

(Organized 1867.)

RESOURCES.	Statement of condition, Dec. 11, 1860.	Statement of condition, March 12, 1861.	Statement of condition, June 18, 1861.	Statement of condition, Sept. 24, 1861.
Loans and discounts less due from directors.....	\$403,005	\$441,684	\$522,359	\$578,184
Due from directors.....	82,490	28,005	27,448	14,595
Overdrafts.....	808	421	259	552
Due from trust companies, State, national and private banks and brokers....	29,801	49,216	37,494	61,447
Real estate.....	88,500	88,500	88,500	88,500
Bonds and mortgages.....	7,578	7,578	7,578	7,578
Stocks and bonds.....	12,978	12,978	12,978	12,978
Specie.....	7,916	6,420	6,750	13,310
U. S. legal tender notes and circulating notes of national banks.....	36,551	47,086	56,497	53,599
Cash items.....	35,721	33,880	84,723	95,185
Loss and expense account.....	6,247	3,886	6,954	3,513
Assets not included in either of the above heads.....	.....	.....	162	.....
Add for cents.....	2	3	5	2
Total resources.....	\$611,587	\$668,152	\$750,102	\$814,388
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	23,590	16,909	19,133	17,513
Due depositors on demand.....	487,997	551,243	630,968	696,875
Add for cents.....	.....	.....	1	.....
Total liabilities.....	\$611,587	\$668,152	\$750,102	\$814,388

FARMERS' BANK - Fayetteville, (Organized 1870.)

MYRON BANGS, *President.*

FRANKLIN M. SEVERANCE, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$63,817	\$70,445	\$79,645	\$74,637
Due from directors.....	15,125	16,000	12,550	10,487
Overdrafts.....	527	1,555	750	927
Due from trust companies, State, national and private banks and brokers.....	5,888	9,100	5,048	12,024
Real estate.....	23,350	14,350	13,100	13,100
Bonds and mortgages.....	8,976	8,976	9,386	9,386
Stocks and bonds.....	7,145	3,751	3,751	8,751
Specie.....	1,040	2,222	1,158	648
U. S. legal tender notes and circulating notes of national banks.....	2,784	3,908	3,893	3,000
Cash items.....	749	474	49	115
Loss and expense account.....	1,108	1,090	.....	48
Add for cents.....	2	2	2	8
Total resources.....	\$124,461	\$131,868	\$129,827	\$128,076
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Surplus fund.....	10,000	10,000	10,000	10,000
Undivided profits.....	2,643	1,113	1,419	472
Due depositors on demand.....	61,817	70,370	66,785	67,561
Due to trust companies, State, national and private banks and brokers.....	.....	886	1,123	43
Add for cents.....	1	.....	.....	1
Total liabilities.....	\$124,461	\$131,868	\$129,827	\$128,076

FIFTH AVENUE BANK — New York City.

JOSEPH S. LOWREY, *Vice-President.*

(Organized 1875.)

A. S. FRISSELL, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 15, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$1,563,203	\$1,787,018	\$1,881,253	\$1,768,024
Due from directors	20,000	20,000	7,809	1,500
Overdrafts	885	499	2,228	490
Due from trust companies, State, national and private banks and brokers ..	80,948	9,922	24,397	21,805
Stocks and bonds	5,000	5,000	5,000	5,000
Specie	828,103	415,896	425,324	431,102
U. S. legal tender notes and circulating notes of national banks	72,386	77,929	95,677	159,201
Cash items	88,380	121,455	60,922	72,351
Assets not included in either of the above heads	18,000	5,000	.....	9,000
Add for cents	2	2	2	2
Total resources	\$2,125,432	\$2,392,746	\$2,502,512	\$2,488,475
LIABILITIES.				
Capital	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund	100,000	100,000	100,000	100,000
Undivided profits	152,016	157,525	169,499	185,485
Due depositors on demand	1,660,111	2,010,251	2,108,069	2,054,007
Due to trust companies, State, national and private banks and brokers	63,803	20,953	24,948	49,933
Amount due, not included in either of the above heads	50,000	4,916	.....	.....
Add for cents	2	1	1	.....
Total liabilities	\$2,125,432	\$2,392,746	\$2,502,512	\$2,488,475

FARMERS' BANK - Fayetteville.

MYRON BANGS, President.

(Organized 1870.)

FRANKLIN M. SEVERANCE, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$63,817	\$70,445	\$79,645	\$74,637
Due from directors.....	15,125	16,000	12,550	10,437
Overdrafts.....	527	1,555	750	927
Due from trust companies, State, national and private banks and brokers.....	5,888	9,100	5,048	12,024
Real estate.....	23,350	14,350	13,100	13,100
Bonds and mortgages.....	8,976	8,976	9,886	9,886
Stocks and bonds.....	7,145	3,751	3,751	8,751
Specie.....	1,040	2,222	1,158	648
U. S. legal tender notes and circulating notes of national banks.....	2,734	3,908	3,893	3,000
Cash items.....	749	474	49	115
Loss and expense account.....	1,108	1,090	.....	48
Add for cents.....	2	2	2	8
Total resources.....	\$124,461	\$131,868	\$129,827	\$128,076
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Surplus fund.....	10,000	10,000	10,000	10,000
Undivided profits.....	2,643	1,113	1,419	472
Due depositors on demand.....	61,317	70,370	66,785	67,561
Due to trust companies, State, national and private banks and brokers.....	.....	366	1,123	43
Add for cents.....	1	.....	.....	1
Total liabilities.....	\$124,461	\$131,868	\$129,827	\$128,076

FIFTH AVENUE BANK — New York City.

JOSEPH S. LOWREY, *Vice-President.*

(Organized 1875.)

A. S. FRISSELL, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 15, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors	\$1,593,203	\$1,787,018	\$1,881,253	\$1,798,024
Due from directors	20,000	20,000	7,809	1,500
Overdrafts	365	499	2,238	490
Due from trust companies, State, national and private banks and brokers ..	80,048	9,922	24,297	21,805
Stocks and bonds	5,000	5,000	5,000	5,000
Specie	828,103	415,896	425,324	431,102
U. S. legal tender notes and circulating notes of national banks	72,386	77,929	95,677	159,201
Cash items	88,880	121,485	60,922	72,851
Assets not included in either of the above heads	18,000	5,000	.....	9,000
Add for cents	2	2	2	2
Total resources	\$2,125,432	\$2,392,746	\$2,502,512	\$2,488,475

LIABILITIES.

Capital	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund	100,000	100,000	100,000	100,000
Undivided profits	152,016	157,525	169,499	185,485
Due depositors on demand	1,600,111	2,010,251	2,108,069	2,054,007
Due to trust companies, State, national and private banks and brokers	63,303	20,053	24,948	49,083
Amount due, not included in either of the above heads	50,000	4,916	.....	.....
Add for cents	2	1	1	.....
Total liabilities	\$2,125,432	\$2,392,746	\$2,502,512	\$2,488,475

FLUSHING AND QUEENS COUNTY BANK — Flushing.

WILLIAM B. DRAPER, *President.*

(Organized 1873.)

L. M. FRANKLIN, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$92,743	\$163,807	\$110,578	\$98,498
Due from directors.....	9,000	4,000	8,000	8,000
Overdrafts.....	893			121
Due from trust companies, State, national and private banks and brokers.....	5,448	961	12,276	5,147
Real estate.....	8,600	8,600	8,600	8,600
Stocks and bonds.....	81,500	86,600	93,100	108,100
Specie.....	1,641	1,850	3,361	3,085
United States legal tender notes and circulating notes of national banks.....	8,881	8,995	5,045	9,462
Cash items.....	1,826	8,520	8,124	718
Loss and expense account.....	4,461	1,233	2,587	4,754
Assets not included in either of the above heads.....	4,466	2,500	2,500	2,500
Add for cents.....	4	1	2	3
Total resources.....	\$213,893	\$277,067	\$249,173	\$231,988

LIABILITIES.

Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	14,906	11,806	16,425	18,221
Due depositors on demand.....	97,814	160,882	130,751	118,267
Due to trust companies, State, national and private banks and brokers.....	1,467	4,928	1,111	499
Due to individuals and corporations other than banks and depositors.....	204		305	
Amount due, not included in either of the above heads.....			579	
Add for cents.....	2	1	2	1
Total liabilities.....	\$218,893	\$277,067	\$249,173	\$231,988

FULTON BANK — Brooklyn.

JOHN WILLIAMS, *President.*

(Organized 1870.)

J. A. NEXSEN, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$633,108	\$703,667	\$702,897	\$755,967
Due from directors.....	73,450	75,050	179,950	88,450
Overdrafts.....	626	977	479	176
Due from trust companies, State, national and private banks and brokers.....	81,336	21,823	21,788	58,199
Real estate.....	15,130	17,215	17,215	17,215
Stocks and bonds.....	12,120	12,120	40,120	42,120
Specie.....	13,609	15,104	21,074	22,419
U. S. legal tender notes and circulating notes of national banks.....	32,079	38,051	47,998	62,871
Cash items.....	82,264	38,033	59,191	63,935
Loss and expense account.....	5,082	2,209	5,598	2,331
Add for cents.....	8	3	2	4
Total resources.....	\$948,807	\$924,252	\$1,096,207	\$1,108,687
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits.....	42,476	48,028	49,129	48,797
Due depositors on demand.....	704,662	680,972	846,209	829,770
Due to trust companies, State, national and private banks and brokers.....	4	.....	725	.....
Due individuals and corporations other than banks and depositors.....	658	.....	.....	.....
Amount due, not included in either of the above heads.....	1,006	252	144	25,120
Add for cents.....	1	.....	.....	.....
Total liabilities.....	\$948,807	\$924,252	\$1,096,207	\$1,108,687

GERMAN AMERICAN BANK—New York City.

H. ROCHOLL, *President.*

(Organized 1870.)

CHARLES O. ANDRUS, *Assistant Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 12, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$2,204,075	\$2,912,179	\$2,582,831	\$2,505,601
Due from directors	8,463	14,862	7,000	12,000
Overdrafts	324			
Due from trust companies, State, national and private banks and brokers...	400,870	133,147	176,333	204,106
Real estate	18,082	4,400	4,400	4,400
Stocks and bonds	16,205	90,801	92,356	70,437
Specie	386,788	522,086	323,606	425,065
U. S. legal tender notes and circulating notes of national banks.....	122,238	118,248	149,405	40,566
Cash items	4,352,791	3,617,116	3,563,954	1,852,421
Loss and expense account.....	15,303	8,351	15,965	4,402
Assets not included in either of the above heads.....	1,036	1,036	1,036	927
Add for cents.....	2	3	2	3
Total resources.....	\$7,521,172	\$6,925,229	\$6,936,388	\$5,119,928
LIABILITIES.				
Capital.....	\$750,000	\$750,000	\$750,000	\$750,000
Undivided profits.....	110,593	105,168	139,579	161,271
Due depositors on demand	6,459,277	5,827,559	5,874,941	3,985,221
Due to trust companies, State, national and private banks and brokers.....	126,188	141,311	146,710	189,268
Amount due, not included in either of the above heads	75,112	1,190	25,157	34,167
Add for cents.....	2	1	1	1
Total liabilities.....	\$7,521,172	\$6,925,229	\$6,936,388	\$5,119,928

F. AUG. GEORGER, President.		GERMAN BANK — Buffalo.		ETIENNE A. GEORGER, Cashier.	
		(Organized 1871.)			
RESOURCES.		Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 13, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	.....	\$863,792	\$878,888	\$961,499	\$966,323
Due from directors	.....	70,000	66,713	70,000	105,000
Overdrafts	.....	1,024	1,699	1,453	4,980
Due from trust companies, State, national and private banks and brokers	.....	68,072	56,198	64,748	110,937
Real estate	.....	26,000	26,000	26,000	26,000
Bonds and mortgages	.....	6,409	6,409	6,409	6,409
Stocks and bonds	.....	1,000	1,000	1,000	1,000
Specie	.....	4,849	6,841	9,036	6,509
U. S. legal tender notes and circulating notes of national banks	.....	9,831	13,433	12,756	10,034
Cash items	.....	15,322	7,316	2,153	1,788
Loss and expense account	.....	6,697	2,728	6,668	2,842
Assets not included in either of the above heads	.....	1,022	894	755	1,110
Add for cents	.....	3	3	4	4
Total resources	.....	\$1,073,921	\$1,068,042	\$1,152,481	\$1,242,936
LIABILITIES.					
Capital	.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund	.....	40,000	50,000	50,000	60,000
Undivided profits	.....	36,632	20,294	40,608	22,927
Due depositors on demand	.....	697,869	640,483	685,683	769,444
Due to trust companies, State, national and private banks and brokers	.....	81,645	148,991	120,551	27,366
Due individuals and corporations other than banks and depositors	.....	124,318	99,456	125,732	195,389
Due treasurer of the State of New York	.....	93,335	73,000	79,955	77,757
Amount due, not included in either of the above heads	.....	.....	45,897	.....	50
Add for cents	.....	2	2	2	3
Total liabilities	.....	\$1,073,921	\$1,068,042	\$1,152,481	\$1,242,936

[Assem. Doc. No. 5.]

GERMAN EXCHANGE BANK — New York City.

M. J. ADRIAN, President.

(Organized 1872.)

A. FAHS, Cashier.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
RESOURCES.				
Loans and discounts less due from directors	\$942,246	\$994,085	\$1,147,920	\$1,858,845
Due from directors	62,367	86,840	101,726	75,569
Due from trust companies, State, national and private banks and brokers	212,674	106,266	185,117	157,943
Real estate	62,000	62,000	62,000	62,000
Stocks and bonds	39,000	39,000	39,000	39,000
Specie	38,262	57,144	23,420	48,059
United States legal tender notes and circulating notes of national banks	67,979	76,025	97,876	97,220
Cash items	88,152	82,948	84,339	107,866
Loss and expense account	2,700	10,066	8,242	10,308
Assets not included in either of the above heads	715	418	490	307
Add for cents	8	2	2	2
Total resources	\$1,511,098	\$1,514,789	\$1,745,132	\$1,951,619
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	60,000	60,000	75,000	75,000
Undivided profits	22,641	40,014	13,038	13,270
Due depositors on demand	1,197,791	1,181,887	1,425,941	1,611,127
Due to trust companies, State, national and private banks and brokers	4,666	7,981	4,324	8,508
Amount due, not included in either of the above heads	25,998	25,406	26,828	25,713
Add for cents	2	1	1	1
Total liabilities	\$1,511,098	\$1,514,789	\$1,745,132	\$1,951,619

GERMANIA BANK — New York City.

O. SCHWARTZELDER, *President.*

(Organized 1890.)

J. A. MORSCHHAUSER, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 14, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors	\$1,100,005	\$1,096,060	\$1,157,699	\$1,316,843
Due from directors	86,288	47,640	56,366	55,710
Due from trust companies, State, national and private banks and brokers	122,515	18,487	22,392	27,978
Real estate	56,418	56,387	56,639	56,166
Stocks and bonds	6,000	6,000	6,000	6,000
Specie	20,347	12,038	19,750	84,394
United States legal tender notes and circulating notes of national banks	73,071	252,160	299,708	385,891
Cash items	71,001	65,628	76,266	127,088
Loss and expense account	2,171	3,387	2,840	2,934
Add for cents	8	2	2	4
Total resources	\$1,537,814	\$1,557,769	\$1,697,652	\$2,012,447
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	50,000	50,000	50,000	50,000
Undivided profits	35,390	43,772	44,483	55,108
Due depositors on demand	1,253,100	1,268,946	1,402,998	1,707,324
Due to trust companies, State, national and private banks and brokers	107	.....	.....	.....
Amount due, not included in either of the above heads	216	51	171	15
Add for cents	1	.....	.....	.....
Total liabilities	\$1,537,814	\$1,557,769	\$1,697,652	\$2,012,447

GERMAN EXCHANGE BANK — New York City.

M. J. ADRIAN, President.

(Organized 1873.)

A. FAHS, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$942,246	\$994,085	\$1,147,920	\$1,858,845
Due from directors.....	62,367	86,840	101,726	75,569
Due from trust companies, State, national and private banks and brokers.....	312,674	106,266	185,117	157,943
Real estate.....	62,000	62,000	62,000	62,000
Stocks and bonds.....	39,000	39,000	39,000	39,000
Specie.....	38,262	57,144	23,420	48,059
United States legal tender notes and circulating notes of national banks.....	67,979	76,025	97,876	97,220
Cash items.....	88,152	82,948	84,839	107,866
Loss and expense account.....	2,700	10,066	8,242	10,308
Assets not included in either of the above heads.....	715	413	490	307
Add for cents.....	3	2	2	2
Total resources.....	\$1,511,098	\$1,514,789	\$1,745,182	\$1,951,619
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund.....	60,000	60,000	75,000	75,000
Undivided profits.....	22,641	40,014	18,038	31,270
Due depositors on demand.....	1,197,791	1,181,887	1,425,941	1,611,127
Due to trust companies, State, national and private banks and brokers.....	4,666	7,981	4,324	8,508
Amount due, not included in either of the above heads.....	25,998	25,406	26,828	25,713
Add for cents.....	2	1	1	1
Total liabilities.....	\$1,511,098	\$1,514,789	\$1,745,182	\$1,951,619

GERMANIA BANK — New York City.

C. SCHWARTZELDER, President.

(Organized 1889.)

J. A. MORSCHHAUSER, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1889.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors	\$1,100,005	\$1,096,060	\$1,157,699	\$1,316,842
Due from directors	86,288	47,640	56,366	55,710
Due from trust companies, State, national and private banks and brokers ..	122,515	18,467	22,382	27,978
Real estate	56,418	56,387	56,639	56,166
Stocks and bonds	6,000	6,000	6,000	6,000
Specie	20,347	12,038	19,750	84,334
United States legal tender notes and circulating notes of national banks ..	73,071	252,160	299,708	335,891
Cash items	71,001	65,628	76,266	127,088
Loss and expense account	2,171	3,387	2,840	2,984
Add for cents	8	2	2	4
Total resources	\$1,537,814	\$1,557,769	\$1,697,652	\$2,012,447
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund	50,000	50,000	50,000	50,000
Undivided profits	35,390	43,773	44,483	55,108
Due depositors on demand	1,253,100	1,268,946	1,402,998	1,707,324
Due to trust companies, State, national and private banks and brokers ..	107	.....	.....	.....
Amount due, not included in either of the above heads	216	51	171	15
Add for cents	1	.....	.....	.....
Total liabilities	\$1,537,814	\$1,557,769	\$1,697,652	\$2,012,447

BANK OF GOUVERNEUR — Gouverneur.

CHARLES ANTHONY, *President.*

(Organized 1876)

HENRY SUDDS, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$130,213	\$127,599	\$137,105	\$136,373
Overdrafts	174	256	598	195
Due from trust companies, State, national and private banks and brokers	49,185	50,684	10,868	41,414
Real estate	6,000	6,000	6,000	6,000
Bonds and mortgages	18,662	25,359	23,759	23,759
Stocks and bonds	36,000	36,000	46,500	47,500
Specie	698	2,401	4,079	5,780
U. S. legal tender notes and circulating notes of national banks	9,394	6,540	6,130	1,905
Cash items	1,514	272	205	1,422
Loss and expense account	3,401	2,171	5,402	8,799
Assets not included in either of the above heads.	1,500	1,500	1,500	1,500
Add for cents	8	2	4	8
Total resources	\$256,744	\$258,784	\$242,145	\$269,600

LIABILITIES.

Capital	\$50,000	\$50,000	\$50,000	\$50,000
Surplus fund	5,505	8,545	8,545	8,746
Undivided profits	5,508	2,361	6,001	2,259
Due depositors on demand	193,862	195,390	176,196	207,953
Due to trust companies, State, national and private banks and brokers.	1,872	2,487	1,402	640
Add for cents	2	1	1	2
Total liabilities	\$266,744	\$258,784	\$242,145	\$269,600

GREENWICH BANK — New York City. (Organized 1865.)

JOHN S. MOLEAN, President.

WILLIAM HAWES, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 19, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$694,664	\$691,157	\$747,732	\$793,799
Due from directors.....	61,250	60,687	61,000	67,000
Due from trust companies, State, national and private banks and brokers.....	31,870	26,605	76,178	40,433
Real estate.....	20,207	20,095	19,982	19,870
Stocks and bonds.....	109,000	119,268	117,233	117,233
Specie.....	10,117	7,174	6,769	6,061
U. S. legal tender notes and circulating notes of national banks.....	48,727	52,955	103,439	41,566
Cash items.....	83,192	55,031	47,970	26,834
Loss and expense account.....	1,776	8,694	1,583	8,386
Add for cents.....	4	4	4	4
Total resources.....	\$1,010,807	\$1,041,560	\$1,181,890	\$1,121,186
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits.....	21,236	34,625	24,945	38,434
Circulation.....	2,605	2,605	2,605	2,605
Due depositors on demand.....	780,979	803,904	953,780	879,655
Due to trust companies, State, national and private banks and brokers.....	5,448	.....	.....	.....
Amount due, not included in either of the above heads.....	588	425	560	491
Add for cents.....	1	1	.....	1
Total liabilities.....	\$1,010,807	\$1,041,560	\$1,181,890	\$1,121,186

HENRY D. BARTO & CO.'S BANK — Trumansburgh.

FRED D. BARTO, Banker and President.

(Organized 1883.)

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$62,404	\$67,321	\$71,449	\$66,956
Due from directors.....	888	516	2,006	3,315
Overdrafts.....	353	84	130	14
Due from trust companies, State, national and private banks and brokers.....	9,183	3,472	5,309	9,022
Real estate.....	500	500	3,500	8,500
Bonds and mortgages.....	1,327	1,527	1,000	1,000
Stocks and bonds.....	7,172	1,400	1,400	1,400
Specie.....	1,520	2,071	2,122	1,691
U. S. legal tender notes and circulating notes of national banks.....	8,029	9,615	5,844	1,976
Cash items.....	79	994	350	424
Loss and expense account.....	84	716	1,105	1,426
Assets not included in either of the above heads.....	60	.....	.....	.....
Add for cents.....	4	4	3	8
Total resources.....	\$68,603	\$88,220	\$94,218	\$90,727
LIABILITIES.				
Capital.....	\$30,000	\$30,000	\$30,000	\$30,000
Undivided profits.....	783	1,808	3,358	5,006
Circulation.....	306	306	306	306
Due depositors on demand.....	54,545	53,298	52,225	47,120
Due to trust companies, State, national and private banks and brokers.....	968	747	2,078	3,102
Amount due, not included in either of the above heads.....	.....	2,000	6,250	5,131
Add for cents.....	1	1	1	2
Total liabilities.....	\$86,603	\$88,220	\$94,218	\$90,727

BANK OF HORNELLSVILLE — Hornellsville.

F. G. BABCOCK, *President.*

(Organized 1875.)

W. E. PITTENGER, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$384,992	\$339,185	\$384,287	\$382,764
Due from directors	7,844	1,551	10,571	4,229
Overdrafts	1,986	1,174	2,496	6,267
Due from trust companies, State, national and private banks and brokers.....	92,841	103,411	110,172	162,468
Bonds and mortgages	8,892	7,892	5,287	5,756
Stocks and bonds	1,072	1,072	1,072	1,072
Specie	6,894	10,726	5,816	8,681
U. S. legal tender notes and circulating notes of national banks.....	20,159	15,505	20,968	18,203
Cash items	1,839	843	826	1,267
Loss and expense account	7,408	1,437	3,371	6,440
Add for cents	2	4	3	8
Total resources	\$483,429	\$481,800	\$544,869	\$587,144
LIABILITIES.				
Capital	\$50,000	\$50,000	\$50,000	\$50,000
Surplus fund	20,000	20,000	20,000	20,000
Undivided profits	35,680	34,753	43,903	53,351
Due depositors on demand	165,446	104,487	186,422	241,297
Due to trust companies, State, national and private banks and brokers.....	10,872	11,128	39,612	29,667
Due individuals and corporations other than banks and depositors.....	171,370	171,370	174,870	174,870
Amount due, not included in either of the above heads.....	30,059	30,059	30,059	17,956
Add for cents	2	3	3	8
Total liabilities	\$483,429	\$481,800	\$544,869	\$587,144

HOWELL M. BEEVE, Banker — Riverhead.
(Organized 1879.)

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$21,627	\$7,086	\$12,778	\$16,265
Due from trust companies, State, national and private banks and brokers....	29,051	53,171	11,819	21,617
Stocks and bonds.....	5,500	5,000	5,750	5,750
Specie.....		400		
U. S. legal tender notes and circulating notes of national banks.....	1,216	1,594	1,250	858
Cash items.....			577	
Loss and expense account.....	310	313	345	305
Assets not included in either of the above heads.....	100	100	100	100
Add for cents.....		1	1	2
Total resources.....	\$57,804	\$67,665	\$82,620	\$84,897
LIABILITIES.				
Capital.....	\$5,000	\$5,000	\$5,000	\$5,000
Surplus fund.....	100	100	100	100
Undivided profits.....	310	313	345	305
Due depositors on demand.....	49,876	61,750	24,965	39,491
Due to trust companies, State, national and private banks and brokers.....	2,517	503	2,210	
Add for cents.....	1			1
Total liabilities.....	\$57,804	\$67,665	\$82,620	\$84,897

ISLAND CITY BANK — New York City. (Organized 1870.)

GEORGE H. ROBINSON, *President.*

GEORGE F. VAIL, *Cashier.*

[Assem. Doc. No. 5.]

RESOURCES.			
	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.
Loans and discounts less due from directors.....	\$240,617	\$248,857	\$200,254
Due from directors	13,300	13,500	10,750
Due from trust companies, State, national and private banks and brokers....	69,730	79,245	83,777
Real estate.....	829	.....	.....
Stocks and bonds	1,095	1,095	1,095
Specie.....	4,284	2,608	2,263
U. S. legal tender notes and circulating notes of national banks.....	19,719	14,216	12,719
Loss and expense account	4,403	1,889	4,507
Assets not included in either of the above heads.....	2,801	3,058	2,763
Add for cents.....	3	8	2
Total resources	\$356,781	\$364,471	\$272,401
			\$275,643
LIABILITIES.			
	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.
Capital.....	\$100,000	\$100,000	\$100,000
Surplus fund.....	.....	7,907	6,352
Undivided profits.....	12,346	9,899	2,688
Due depositors on demand.....	244,327	254,480	160,909
Amount due, not included in either of the above heads.....	108	91	91
Add for cents.....	.....	1	1
Total liabilities.....	\$356,781	\$364,471	\$272,401
			\$275,643

LONG ISLAND BANK — Brooklyn.

JOHN SNIFFIN, President.

(Organized 1845.)

JOHN H. DITMAS, Cashier.

ESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,088,416	\$894,257	\$1,093,166	\$1,138,227
Due from directors.....	47,608	27,958	25,650	28,900
Overdrafts.....	244	57	472	39
Due from trust companies, State, national and private banks and brokers.....	11,548	24,448	.....	84,608
Real estate.....	6,600	6,600	.....	6,600
Stocks and bonds.....	290,900	287,900	244,400	194,400
Specie.....	4,125	8,113	3,428	3,354
United States legal tender notes and circulating notes of national banks.....	22,940	18,518	28,877	28,858
Cash items.....	44,055	46,164	60,185	16,516
Loss and expense account.....	7,128	8,020	7,611	2,594
Assets not included in either of the above heads.....	7,434	7,434	7,434	7,434
Add for cents.....	3	3	2	2
Total resources.....	\$1,531,001	\$1,309,472	\$1,477,325	\$1,440,027
LIABILITIES.				
Capital.....	\$400,000	\$400,000	\$400,000	\$400,000
Undivided profits.....	66,986	55,900	76,168	71,959
Circulation.....	6,434	6,434	6,434	6,434
Due depositors on demand.....	1,042,420	836,022	954,967	950,980
Due to trust companies, State, national and private banks and brokers.....	14,123	9,144	39,265	15,292
Amount due, not included in either of the above heads.....	1,087	1,971	489	1,410
Add for cents.....	1	1	2	2
Total liabilities.....	\$1,531,001	\$1,309,472	\$1,477,325	\$1,446,027

MANHATTAN COMPANY — New York City.

WILLIAM HENRY SMITH, *President.*

(Organized 1799.)

J. T. BALDWIN, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$6,343,980	\$6,708,969	\$7,010,147	\$7,579,159
Due from directors	290,184	212,195	406,753	50,000
Due from trust companies, State, national and private banks and brokers ..	316,214	304,750	304,750	353,111
Real estate	10,000	10,000	10,000	304,750
Bonds and mortgages	660,591	927,882	1,178,958	10,000
Specie	333,406	205,871	430,998	775,045
U. S. legal tender notes and circulating notes of national banks	1,114,983	1,081,845	1,533,333	280,220
Cash items	39,454	7,408	29,260	921,409
Loss and expense account	2	4	3	6,610
Add for cents				3
Total resources	\$9,108,794	\$9,458,424	\$10,904,202	\$10,280,307

LIABILITIES.

Capital	\$2,050,000	\$2,050,000	\$2,050,000	\$2,050,000
Undivided profits	1,114,945	1,056,908	1,156,330	1,960,612
Circulation	845	845		
Due depositors on demand	4,417,075	4,466,305	5,250,396	5,536,458
Due to trust companies, State, national and private banks and brokers	1,505,949	1,826,013	2,363,543	1,564,999
Due Treasurer of the State of New York	11,876	42,943	64,126	50,713
Amount due, not included in either of the above heads	8,602	15,908	10,805	17,523
Add for cents	2	2	2	2
Total liabilities	\$9,108,794	\$9,458,424	\$10,904,202	\$10,280,807

MANUFACTURERS' BANK — Cohoes.

JOHN V. S. LANSING, *Vice-President.*

(Organized 1872.)

W. T. SEYMOUR, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$244,950	\$262,241	\$265,202	\$277,146
Due from directors.....	950	700	4,978	850
Overdrafts.....	4	74	437	89
Due from trust companies, State, national and private banks and brokers.....	47,241	1,850	13,651	32,828
Real estate.....	18,019	13,919	17,164	17,410
Bonds and mortgages.....	8,595	6,395	6,345	6,345
Stocks and bonds.....	7,350	7,850	7,850	7,850
Specie.....	2,309	2,046	2,493	1,855
U. S. legal tender notes and circulating notes of national banks.....	18,811	16,317	10,912	19,765
Cash items.....	885	1,585	517	428
Loss and expense account.....	8,976	833	2,154	2,013
Assets not included in either of the above heads.....	1,500	1,500	1,500	1,500
Add for cents.....	4	4	8	5
Total resources.....	\$349,594	\$314,814	\$332,701	\$366,528
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	24,845	18,776	25,786	28,605
Due depositors on demand.....	224,713	192,595	204,213	234,123
Due to trust companies, State, national and private banks and brokers.....	.....	8,364	2,698	8,799
Amount due, not included in either of the above heads.....	34	78	8	.....
Add for cents.....	2	1	1	1
Total liabilities.....	\$349,594	\$314,814	\$332,701	\$366,528

MANUFACTURERS AND TRADERS' BANK — Buffalo.

HENRY MARTIN, *President.*

(Organized 1856.)

JAMES H. MADISON, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$2,830,670	\$2,218,897	\$2,408,479	\$2,327,305
Due from directors	48,865	82,487	35,800	18,000
Overdrafts	1,912	10,039	1,719	2,103
Due from trust companies, State, national and private banks and brokers	125,557	110,646	443,851	280,260
Real estate	22,520	22,520	20,670	20,570
Bonds and mortgages	12,982	12,982	14,082	14,082
Stocks and bonds	132,000	128,000	105,000	130,000
Specie	55,244	45,303	33,646	28,816
U. S. legal tender notes and circulating notes of national banks	74,802	62,996	78,385	87,560
Cash items	6,261	8,328	4,822	1,288
Loss and expense account	11,773	5,259	11,842	5,821
Assets not included in either of the above heads	.....	.....	.....	875
Add for cents	4	3	5	3
Total resources	\$2,817,090	\$2,707,460	\$3,158,251	\$2,916,683
LIABILITIES.				
Capital	\$900,000	\$900,000	\$900,000	\$900,000
Undivided profits	176,543	146,157	198,187	146,140
Due depositors on demand	1,499,087	1,474,602	1,879,102	1,650,480
Due to trust companies, State, national and private banks and brokers	128,624	113,700	106,007	121,985
Due Treasurer of the State of New York	117,854	73,000	79,955	98,077
Add for cents	2	1	.....	1
Total liabilities	\$2,817,090	\$2,707,460	\$3,158,251	\$2,916,683

MARINE BANK — Buffalo.STEPHEN M. CLEMENT, *President.*

(Organized 1850.)

WILLIAM K. ALLEN, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,392,576	\$1,222,432	\$1,046,405	\$1,395,292
Overdrafts.....	184	1,190	806	2,066
Due from trust companies, State, national and private banks and brokers...	35,306	79,326	439,518	261,562
Real estate.....	40,220	44,006	54,800	50,000
Bonds and mortgages.....	875	875	575	575
Stocks and bonds.....	109,532	159,532	208,532	208,532
Specie.....	7,794	11,112	5,945	8,084
United States legal tender notes and circulating notes of national banks...	27,730	13,871	20,980	28,390
Cash items.....	1,554	311	3,889	757
Loss and expense account.....	6,867	2,659	8,265	3,029
Assets not included in either of the above heads.....	133	102	.....	215
Add for cents.....	4	4	4	2
Total resources.....	\$1,622,775	\$1,535,420	\$1,788,619	\$1,958,504
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits.....	183,300	161,308	186,295	168,510
Due depositors on demand.....	1,038,946	987,631	1,180,813	1,301,207
Due to trust companies, State, national and private banks.....	107,594	113,480	141,556	211,014
Due Treasurer of the State of New York.....	97,933	73,000	79,955	77,772
Add for cents.....	2	1	.....	1
Total liabilities.....	\$1,622,775	\$1,535,420	\$1,788,619	\$1,958,504

MECHANICS' BANK — Brooklyn.DANIEL CHAUNCEY, *President.*

(Organized 1832.)

GEORGE W. WHITE, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
	\$1,047,681	\$1,037,055	\$1,298,205	\$1,195,153
Loans and discounts less due from directors.....	129,204	127,400	146,800	123,700
Due from directors.....	730	695	160	627
Overdrafts.....	930,820	1,108,732	1,112,729	834,851
Due from trust companies, State, national and private banks and brokers.....	75,000	75,000	75,000	75,000
Real estate.....	287,294	287,294	287,294	314,910
Stocks and bonds.....	11,552	17,579	18,736	15,500
Specie.....	115,967	106,879	117,293	127,076
United States legal tender notes and circulating notes of national banks.....	100,531	258,243	127,115	32,884
Cash items.....	11,046	3,650	9,900	4,123
Loss and expense account.....	2	2	3	2
Add for cents.....				
Total resources.....	\$2,729,827	\$3,042,529	\$3,188,235	\$2,723,886
LIABILITIES.				
	\$500,000	\$500,000	\$500,000	\$500,000
Capital.....	385,407	369,337	368,807	381,165
Surplus fund.....	33,862	24,331	51,784	21,198
Undivided profits.....	5,483	5,483	5,482	5,483
Circulation.....	1,784,177	2,120,792	2,242,577	1,805,607
Due depositors on demand.....	20,102	21,452	19,144	8,975
Due to trust companies, State, national and private banks and brokers.....	795	1,142	440	1,458
Amount due not included in either of the above heads.....	2	3	1	1
Add for cents.....				
Total liabilities.....	\$2,729,827	\$3,042,529	\$3,188,235	\$2,723,886

MECHANICS AND FARMERS' BANK — Albany.

(Organized 1888.)

DUDLEY OLCOTT, *President.*

GEORGE G. DAVIDSON, *Cashier.*

RESOURCES.		Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$617,442	\$591,825	\$684,318	\$698,809	
Due from directors.....	42,410	40,411	10,992	812,135	
Overdrafts.....	218	749	257	611	
Due from trust companies, State, national and private banks and brokers.....	492,292	410,575	589,300	493,041	
Real estate.....	23,008	23,008	23,008	23,008	
Bonds and mortgages.....	25,813	25,813	25,813	25,813	
Stocks and bonds.....	737,500	841,500	721,500	721,500	
Specie.....	16,349	18,949	13,418	7,144	
United States legal tender notes and circulating notes of national banks.....	24,693	17,775	27,650	47,808	
Cash items.....	10,389	17,707	15,397	13,806	
Loss and expense account.....	54,227	43,087	68,536	62,926	
Add for cents.....	3	4	4	4	
Total resources.....	\$2,044,344	\$2,031,403	\$2,180,188	\$2,406,605	
LIABILITIES.					
Capital.....	\$350,000	\$350,000	\$350,000	\$350,000	
Surplus fund.....	650,000	650,000	650,000	650,000	
Due depositors on demand.....	931,560	910,472	1,083,479	1,268,080	
Due to trust companies, State, national and private banks and brokers.....	82,917	105,779	74,714	118,864	
Amount due, not included in either of the above heads.....	29,865	15,152	21,994	19,560	
Add for cents.....	2	.....	1	1	
Total liabilities.....	\$2,044,344	\$2,031,403	\$2,180,188	\$2,406,605	

MECHANICS' BANK — Brooklyn.

DANIEL CHAUNCEY, President.

(Organized 1852.)

GEORGE W. WHITE, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,047,681	\$1,057,055	\$1,298,205	\$1,195,153
Due from directors.....	129,204	127,400	146,800	123,700
Overdrafts.....	780	695	160	637
Due from trust companies, State, national and private banks and brokers.....	950,320	1,108,732	1,112,729	894,851
Real estate.....	75,000	75,000	75,000	75,000
Stocks and bonds.....	287,294	287,294	287,294	814,910
Specie.....	11,552	17,579	18,736	15,500
United States legal tender notes and circulating notes of national banks.....	115,967	106,879	117,293	127,076
Cash items.....	100,531	258,243	197,115	32,884
Loss and expense account.....	11,046	3,650	9,900	4,123
Add for cents.....	2	2	3	2
Total resources.....	\$2,729,827	\$3,042,529	\$3,188,285	\$2,723,886
LIABILITIES.				
Capital.....	\$500,000	\$500,000	\$500,000	\$500,000
Surplus fund.....	385,407	369,337	368,807	381,165
Undivided profits.....	83,862	24,321	51,784	21,198
Circulation.....	5,482	5,482	5,482	5,482
Due depositors on demand.....	1,784,177	2,120,792	2,242,577	1,805,607
Due to trust companies, State, national and private banks and brokers.....	20,102	21,452	19,144	8,975
Amount due not included in either of the above heads.....	795	1,142	440	1,458
Add for cents.....	2	3	1	1
Total liabilities.....	\$2,729,827	\$3,042,529	\$3,188,285	\$2,723,886

MECHANICS AND FARMERS' BANK — Albany.

DUDLEY OLCOTT, President.

(Organized 1888.)

GEORGE G. DAVIDSON, Cashier.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
RESOURCES.				
Loans and discounts less due from directors.....	\$617,442	\$591,825	\$684,313	\$698,899
Due from directors.....	42,410	40,411	10,992	312,135
Overdrafts.....	218	749	257	493,611
Due from trust companies, State, national and private banks and brokers ..	492,292	410,575	589,300	589,300
Real estate.....	23,008	23,008	23,008	23,008
Bonds and mortgages.....	25,813	25,813	25,813	25,813
Stocks and bonds	737,500	841,500	721,500	721,500
Specie'.....	10,349	18,949	13,418	7,144
United States legal tender notes and circulating notes of national banks.....	24,693	17,775	27,650	47,808
Cash items.....	10,389	17,707	15,397	13,806
Loss and expense account.....	54,227	43,087	68,536	62,926
Add for cents.....	3	4	4	4
Total resources.....	\$2,044,344	\$2,031,403	\$2,180,188	\$2,406,605
LIABILITIES.				
Capital.....	\$350,000	\$350,000	\$350,000	\$350,000
Surplus fund.....	650,000	650,000	650,000	650,000
Due depositors on demand	931,560	910,472	1,083,479	1,268,080
Due to trust companies, State, national and private banks and brokers.....	82,917	105,779	74,714	118,864
Amount due, not included in either of the above heads.....	29,865	15,152	21,994	19,660
Add for cents.....	2	.....	1	1
Total liabilities.....	\$2,044,344	\$2,031,403	\$2,180,188	\$2,406,605

[Assem. Doc. No. 5.]

10

MECHANICS' BANK — Brooklyn.

DANIEL CHAUNCEY, *President.*

(Organized 1832.)

GEORGE W. WHITE, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,047,681	\$1,057,055	\$1,298,205	\$1,195,153
Due from directors.....	129,204	127,400	146,800	128,700
Overdrafts.....	780	695	160	627
Due from trust companies, State, national and private banks and brokers.....	950,820	1,108,732	1,112,729	884,851
Real estate.....	75,000	75,000	75,000	75,000
Stocks and bonds.....	287,294	287,294	287,294	314,910
Specie.....	11,552	17,579	18,736	15,500
United States legal tender notes and circulating notes of national banks.....	115,967	106,879	117,293	127,076
Cash items.....	100,531	258,243	127,115	32,884
Loss and expense account.....	11,046	3,650	9,900	4,123
Add for cents.....	2	2	3	2
Total resources.....	\$2,729,827	\$3,042,529	\$3,188,235	\$2,723,886
LIABILITIES.				
Capital.....	\$500,000	\$500,000	\$500,000	\$500,000
Surplus fund.....	385,407	369,337	368,807	381,165
Undivided profits.....	38,802	24,321	51,784	21,198
Circulation.....	5,482	5,482	5,482	5,482
Due depositors on demand.....	1,784,177	2,120,792	2,242,577	1,805,607
Due to trust companies, State, national and private banks and brokers.....	20,102	21,452	19,144	8,975
Amount due not included in either of the above heads.....	795	1,142	440	1,458
Add for cents.....	2	3	1	1
Total liabilities.....	\$2,729,827	\$3,042,529	\$3,188,235	\$2,723,886

MECHANICS AND FARMERS' BANK — Albany. (Organized 1838.)

DUDLEY OLCOTT, *President*

GEORGE G. DAVIDSON, *Cashier*.

[Assem. Doc. No. 5.]

RESOURCES.			
Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$617,442	\$591,825	\$698,809
Due from directors.....	42,410	40,411	312,135
Overdrafts.....	218	749	611
Due from trust companies, State, national and private banks and brokers ..	492,292	410,575	493,041
Real estate.....	23,008	23,008	23,008
Bonds and mortgages.....	25,813	25,813	25,813
Stocks and bonds	737,500	841,500	721,500
Specie.....	16,349	18,949	7,144
United States legal tender notes and circulating notes of national banks.....	24,693	17,775	47,808
Cash items.....	10,389	17,707	13,806
Loss and expense account.....	54,227	43,087	62,926
Add for cents.....	3	4	4
Total resources.....	\$2,044,344	\$2,031,403	\$2,406,605
LIABILITIES.			
Capital.....	\$350,000	\$350,000	\$350,000
Surplus fund.....	650,000	650,000	650,000
Due depositors on demand.....	931,560	910,472	1,268,980
Due to trust companies, State, national and private banks and brokers.....	82,917	105,779	118,864
Amount due, not included in either of the above heads.....	29,865	15,152	19,660
Add for cents.....	2	.....	1
Total liabilities.....	\$2,044,344	\$2,031,403	\$2,406,605

MECHANICS AND TRADERS' BANK — Brooklyn.

ARCHIBALD K. MESEROLE, *President.*

(Organized 1887.)

HENRY J. OLDRING, Jr., *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$277,211	\$302,008	\$238,447	\$373,034
Due from directors	11,633	13,167	17,245	15,303
Overdrafts .....	.....	.....	483	.....
Due from trust companies, State, national and private banks and brokers..	80,082	79,224	150,832	77,838
Real estate.....	18,000	18,000	18,000	18,000
Stocks and bonds.....	64,000	64,000	65,000	65,000
Specie.....	18,285	7,598	6,894	9,817
United States legal tender notes and circulating notes of national banks....	19,040	24,787	29,311	26,444
Cash items.....	4,053	538	768	904
Loss and expense account	2,510	1,220	3,849	1,126
Assets not included in either of the above heads	2,150	2,150	2,315	2,315
Add for cents.....	1	2	3	2
Total resources.....	\$491,965	\$512,694	\$531,147	\$589,783
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits	13,816	10,684	15,309	12,977
Due depositors on demand	368,986	869,609	410,248	472,350
Due to trust companies, State, national and private banks and brokers.....	8,928	11,793	5,394	4,130
Due individuals and corporations other than banks and depositors.....	234	263	39	289
Amount due, not included in either of the above heads.....	.....	345	165	85
Add for cents.....	1	1	2	2
Total liabilities.....	\$491,965	\$512,694	\$531,147	\$589,783

MERCHANTS' BANK OF BUFFALO.

ALFRED P. WRIGHT, *President.*

(Organized 1881.)

J. W. BRIDGMAN, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 12, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$447,885	\$921,987
Due from directors.....	32,000	.....
Overdrafts.....	15	1,026
Due from trust companies, State, national and private banks and brokers.....	226,395	144,065
Stocks and bonds.....	1,000	1,000
Specie.....	7,461	3,515
United States legal tender notes and circulating notes of national banks.....	80,704	10,462
Cash items.....	1,124	845
Loss and expense account.....	8,083	7,069
Assets not included in either of the above heads.....	2,450	2,705
Add for cents.....	3	3
Total resources.....	\$751,720	\$1,092,627
LIABILITIES.				
Capital.....	\$300,000	\$300,000
Undivided profits.....	5,994	22,059
Due depositors on demand.....	398,646	737,749
Due to trust companies, State, national and private banks and brokers.....	40,124	10,191
Due Treasurer of the State of New York.....	6,955	22,628
Add for cents.....	1	.....
Total liabilities.....	\$751,720	\$1,092,627

MERCHANTS' BANK — Watertown.

WILLARD IVES, *President.*

(Organized 1870.)

JOHN F. MOFFETT, *Cashier.*

RESOURCES	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$660,877	\$669,951	\$587,266	\$632,708
Overdrafts.....	8,277	7,357	5,874	5,747
Due from trust companies, State, national and private banks and brokers	126,738	48,794	47,256	53,381
Real estate	53,990	53,990	52,490	52,490
Bonds and mortgages	28,162	24,442	23,020	23,330
Stocks and bonds	34,050	66,253	70,553	74,489
Specie	6,377	4,341	4,036	7,043
United States legal tender notes and circulating notes of national banks	14,330	5,793	8,462	9,378
Cash items.....	13,253	16,949	7,555	13,078
Loss and expense account.....	5,015	3,619	8,901	3,474
Assets not included in either of the above heads.....	.....	1,702	.....	2,733
Add for cents.....	5	5	3	4
Total resources.....	\$951,074	\$903,096	\$816,016	\$808,305
LIABILITIES.				
Capital.....	\$210,000	\$210,000	\$210,000	\$210,000
Surplus fund	19,975	17,830	17,193	14,813
Undivided profits	16,559	10,420	20,083	9,686
Due depositors on demand.....	605,719	649,416	541,995	627,523
Due to trust companies, State, national and private banks and brokers.	5,162	2,083	5,089	5,802
Due individuals and corporations other than banks and depositors.....	93,551	13,234	21,654	414
Amount due, not included in either of the above heads.....	106	112	.....	66
Add for cents.....	2	1	2	1
Total liabilities	\$951,074	\$903,096	\$816,016	\$808,305

BANK OF THE METROPOLIS — New York City.

ROBERT SCHELL, *President.*

(Organized 1871.)

THEODORE ROGERS, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,919,386	\$2,142,934	\$2,528,933	\$2,358,004
Due from directors.....	214,088	55,614	12,000	36,000
Overdrafts.....	574	815	862	739
Due from trust companies, State, national and private banks and brokers...	332,899	323,832	283,097	199,764
Real estate.....	12,789	12,789	12,789	12,789
Bonds and mortgages.....	11,875	11,000	13,125	12,250
Stocks and bonds.....	9,450	109,450	110,450	110,450
Specie.....	30,117	98,687	18,058	54,141
United States legal tender notes and circulating notes of national banks...	548,599	538,703	838,856	535,403
Cash items.....	279,402	227,955	611,544	190,823
Loss and expense account.....	20,205	8,221	21,148	6,998
Assets not included in either of the above heads.....	18,000	10,000	22,000	19,000
Add for cents.....	3	2	3	3
Total resources.....	\$3,397,387	\$3,475,002	\$4,472,865	\$3,535,954
LIABILITIES.				
Capital.....	\$300,000	\$300,000	\$300,000	\$300,000
Undivided profits.....	104,955	88,993	121,256	114,307
Due depositors on demand.....	2,673,772	2,879,482	3,764,009	2,867,969
Due to trust companies, State, national and private banks and brokers.....	318,066	206,034	286,899	252,720
Amount due, not included in either of the above heads.....	492	492	100	956
Add for cents.....	2	1	1	2
Total liabilities.....	\$3,397,287	\$3,475,002	\$4,472,865	\$3,535,954

BANK OF MONROE — Rochester. (Organized 1867.)

HIRAM SIBLEY, President.

WILLIAM R. SEWARD, Cashier

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 1 st , 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$534,508	\$539,818	\$478,136	\$625,583
Due from directors	45,572	40,999	29,747	57,179
Overdrafts	176	541	73	50
Due from trust companies, State, national and private banks and brokers.....	24,849	28,448	40,112	34,779
Real estate	38,165	38,508	38,560	37,720
Bonds and mortgages.....	18,321	18,089	18,589	15,650
Stocks and bonds	1,000	1,000	1,000	1,000
Specie	3,701	2,768	5,413	6,903
United States legal tender notes and circulating notes of national banks	9,688	12,917	13,580	10,162
Cash items	2,086	6,679	6,628	8,278
Loss and expense account.....	4,117	1,971	4,124	1,894
Add for cents	4	3	5	3
Total resources.....	\$682,187	\$691,741	\$635,967	\$799,201
LIABILITIES.				
Capital	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund	50,000	50,000	50,000	50,000
Undivided profits	46,761	48,644	59,947	57,773
Due depositors on demand.....	377,735	390,657	169,975	244,852
Due to trust companies, State, national and private banks and brokers.....	5,690	12,439	24,643	22,075
Due individuals and corporations other than banks and depositors.....	100,000	50,000	230,000	323,000
Due Treasurer of the State of New York.....	2,000	37,000	2,000	2,000
Amount due, not included in either of the above heads .....	.....	3,000	.....	.....
Add for cents.....	1	1	2	1
Total liabilities	\$682,187	\$691,741	\$635,967	\$799,201

MOUNT MORRIS BANK — New York City.

ALEXANDER P. KETCHUM, President.

(Organized 1881.)

THOMAS W. ROBINSON, Cashier.

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$138,717	\$178,636	\$215,041
Due from directors.....	61,230	58,848	58,857
Due from trust companies, State, national and private banks and brokers.....	15,421	29,815	43,489
Stocks and bonds.....	21,042	21,942	21,942
Specie.....	2,333	4,262	4,916
United States legal tender notes and circulating notes of national banks.....	9,064	9,368	5,965
Cash items.....	496	6,147	4,815
Loss and expense account.....	2,982	6,175	8,978
Assets not included in either of the above heads.....	1,005	2,663	2,843
Add for cents.....	8	2	2
Total resources.....	\$253,132	\$317,848	\$366,848

LIABILITIES.

Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	2,683	7,083	11,922	11,922
Due depositors on demand.....	143,706	202,028	230,818	230,818
Due to trust companies, State, national and private banks and brokers.....	6,792	8,736	25,208	25,208
Add for cents.....	1	1	.....	.....
Total liabilities.....	\$253,132	\$317,848	\$366,848	\$366,848

MURRAY HILL BANK — New York City.

WILLIAM A. DARLING, *President.*

(Organized 1870.)

ALBERT H. GALE, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$809,472	\$882,014	\$754,264	\$736,857
Due from directors	29,950	36,800	41,558	48,445
Overdrafts	76	84	138	124
Due from trust companies, State, national and private banks and brokers	87,495	68,310	64,370	38,749
Bonds and mortgages	1,362	1,365	1,950	1,265
Stocks and bonds	1,100	1,100	1,100	1,100
Specie	31,510	33,908	23,235	17,312
United States legal tender notes and circulating notes of national banks	42,709	51,210	51,636	70,947
Cash items	55,851	51,884	50,836	39,060
Loss and expense account	9,322	7,765	12,587	5,958
Assets not included in either of the above heads	6,125	7,112	8,245	8,433
Add for cents	4	2	3	4
Total resources	\$874,976	\$936,554	\$1,003,322	\$968,254
LIABILITIES.				
Capital	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund	50,000	50,000	50,000	60,000
Undivided profits	47,965	41,202	54,184	38,290
Due depositors on demand	673,054	724,666	745,826	759,702
Due to trust companies, State, national and private banks and brokers	3,485	9,620	58,910	9,139
Amount due, not included in either of the above heads	471	11,064	403	1,122
Add for cents	1	2	.....	1
Total liabilities	\$874,976	\$936,554	\$1,003,322	\$968,254

NASSAU BANK — New York City.
(Organized 1852.)

FRANCIS M. HARRIS, *President.*WILLIAM H. ROGERS, *Cashier.***RESOURCES**

	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$2,232,213	\$2,407,707	\$2,788,595	\$2,912,460
Due from directors	4,519	5,400	6,000	6,000
Due from trust companies, State, national and private banks and brokers	270,990	228,548	276,030	200,908
Real estate	169,708	169,478	4,208	3,842
Stocks and bonds	5,000	5,000	5,000	5,000
Specie	173,280	125,657	77,115	299,606
United States legal tender notes and circulating notes of national banks	100,773	131,302	132,000	115,041
Cash items	217,446	406,071	220,397	205,115
Loss and expense account	4,539	24,218	6,465	26,247
Assets not included in either of the above heads	8,900	3,900	3,900	3,900
Add for cents	2	2	2	2
Total resources	\$3,248,370	\$3,507,873	\$3,519,732	\$3,838,181

LIABILITIES.

	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Capital	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Surplus fund	63,303	65,215	117,039	117,039
Undivided profits	12,541	43,476	12,086	45,060
Circulation	3,900	3,900	3,900	3,900
Due depositors on demand	2,038,213	2,315,548	2,339,124	2,507,135
Due to trust companies, State, national and private banks and brokers	136,007	76,887	43,040	102,501
Amount due, not included in either of the above heads	4,404	2,346	3,941	2,544
Add for cents	2	1	2	2
Total liabilities	\$3,248,370	\$3,507,873	\$3,519,732	\$3,838,181

NEW YORK STATE BANKING COMPANY — Syracuse.

NATHAN F. GRAVES, President.

(Organized 1877.)

RASSELAS A. BONTA, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$247,095	\$303,419	\$305,316	\$334,348
Due from directors.....	12,132	34,509	19,750	20,050
Overdrafts.....	7,647	.....	606	.....
Due from trust companies, State, national and private banks and brokers.....	41,512	21,932	27,613	30,126
Stocks and bonds.....	1,799	1,739	1,739	1,739
Specie.....	6,584	1,501	1,777	1,664
United States legal tender notes and circulating notes of national banks.....	8,315	6,342	12,650	16,021
Cash items.....	2,198	2,348	3,576	3,548
Loss and expense account.....	420	2,156	428	2,362
Add for cents.....	4	2	8	8
Total resources.....	\$327,706	\$374,148	\$373,458	\$461,061
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	13,560	16,085	14,658	19,098
Due depositors on demand.....	175,326	202,078	213,984	284,245
Due to trust companies, State, national and private banks and brokers.....	3,018	28,983	17,043	27,336
Due Treasurer of the State of New York.....	35,802	27,030	27,771	30,386
Add for cents.....	.....	2	2	1
Total liabilities.....	\$327,706	\$374,148	\$373,458	\$461,061

BANK OF NORTH AMERICA—New York City.

WILLIAM DOWD, *President.*

(Organized 1880.)

FREDERICK W. WHITEMORE, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,720,355	\$1,931,027	\$2,612,891	\$2,270,665
Due from directors.....	574,459	522,089	417,390	440,585
Overdrafts.....	21,749	5,582	6,730	11,629
Due from trust companies, State, national and private banks and brokers.....	279,172	119,160	144,898	137,853
Real estate.....	175,000	175,000	175,000	175,000
Bonds and mortgages.....	15,000	15,000	15,000	15,000
Stocks and bonds.....	10,775	10,775	20,975	55,775
Specie.....	471,705	211,067	562,183	170,586
United States legal tender notes and circulating notes of national banks....	201,116	152,607	192,680	301,873
Cash items.....	8,514,790	3,148,652	3,297,673	2,052,328
Loss and expense account.....	19,538	6,284	16,391	6,882
Assets not included in either of the above heads.....	11,703	11,703	10,511	14,511
Add for cents.....	4	4	2	3
Total resources.....	\$7,015,366	\$6,308,950	\$7,472,274	\$5,658,690
LIABILITIES.				
Capital.....	\$700,000	\$700,000	\$700,000	\$700,000
Undivided profits.....	204,639	186,724	209,151	198,359
Due depositors on demand.....	4,951,424	4,292,270	4,928,952	3,652,635
Due to trust companies, State, national and private banks and brokers.....	1,157,142	1,125,899	1,631,760	1,104,873
Amount due, not included in either of the above heads.....	2,160	4,085	2,409	3,321
Add for cents.....	1	2	2	2
Total liabilities.....	\$7,015,366	\$6,308,950	\$7,472,274	\$5,658,690

NORTH RIVER BANK — New York City.

LEVI APGAR, *President.*

(Organized 1842.)

E. E. GEDNEY, *Cashier.*

RESOURCES.

Loans and discounts less due from directors	\$915,659	\$795,084	\$865,392	\$866,335
Due from directors	38,212	36,460	37,323	36,707
Overdrafts	6,496	6,995	5,608	5,785
Due from trust companies, State, national and private banks and brokers	186,526	118,949	174,963	150,212
Real estate	47,890	49,300	49,433	48,913
Bonds and mortgages	1,500	.....	.....	.....
Stocks and bonds	216,246	216,246	214,950	256,950
Specie	36,889	23,704	20,774	46,633
United States legal tender notes and circulating notes of national banks	91,191	158,575	198,906	218,562
Cash items	144,623	128,229	103,040	128,148
Loss and expense account	11,868	8,078	14,763	4,997
Add for cents	2	4	3	4
Total resources	\$1,697,052	\$1,536,714	\$1,685,155	\$1,763,246

LIABILITIES.

Capital	\$240,000	\$240,000	\$240,000	\$240,000
Surplus fund	55,981	59,626	56,115	57,090
Undivided profits	30,066	11,372	37,616	14,068
Due depositors on demand	1,170,583	1,222,648	1,948,822	1,444,735
Due to trust companies, State, national and private banks and brokers	200,000	241	114	287
Amount due not included in either of the above heads	431	2,824	2,485	7,056
Add for cents	1	3	3	1
Total liabilities	\$1,697,052	\$1,536,714	\$1,685,155	\$1,763,246

OGDENSBURG BANK — Ogdensburg.

JAMES S. BEAN, Vice-President.

(Organized 1870.)

W. A. EGERT, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$523,884	\$549,675	\$478,474	\$480,957
Overdrafts.....	537	2,531	2,925	2,086
Due from trust companies, State, national and private banks and brokers.....	11,614	1,744	5,359	2,309
Real estate.....	8,000	8,000	8,000	8,000
Bonds and mortgages.....	.....	.....	5,000	5,000
Stocks and bonds.....	36,000	36,000	63,000	61,000
Specie.....	843	3,697	448	816
United States legal tender notes and circulating notes of national banks.....	15,264	16,299	19,773	17,276
Cash items.....	13,530	8,259	4,199	11,113
Loss and expense account.....	6,475	3,964	6,092	4,748
Assets not included in either of the above heads.....	2,956	4,380	107,000	122,000
Add for cents.....	2	3	4	3
Total resources.....	\$619,085	\$634,552	\$699,674	\$714,808
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	24,655	16,613	27,951	22,021
Due depositors on demand.....	471,846	513,223	556,726	567,870
Due to trust companies, State, national and private banks and brokers.....	22,243	4,374	14,996	23,746
Amount due, not included in either of the above heads.....	939	841	.....	1,170
Add for cents.....	2	1	1	1
Total liabilities.....	\$619,085	\$634,552	\$699,674	\$714,808

ONEIDA COUNTY BANK — Utica.
(Organized 1883.)

FRANCIS KERNAN, *President.*

J. M. BUTLER, *Cashier.*

	RESOURCES.			
	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$546,740	\$523,220	\$569,696	\$681,648
Due from directors.....	30,092	23,219	27,203	24,552
Overdrafts.....	133	68	23	9
Due from trust companies, State, national and private banks and brokers.....	187,114	215,154	205,939	149,062
Real estate.....	10,489	10,489	10,489	10,489
Stocks and bonds.....	23,400	39,150	5,000	8,545
Specie.....	9,877	20,901	17,970	17,459
United States legal tender notes and circulating notes of national banks ..	19,601	24,080	36,344	16,531
Cash items.....	4,577	15,846	1,406	8,755
Loss and expense account.....	3,903	654	2,508	794
Assets not included in either of the above heads.....	307	149	.....	.....
Add for cents.....	8	4	2	2
Total resources.....	\$835,736	\$872,934	\$876,580	\$912,846
LIABILITIES.				
Capital.....	\$125,000	\$125,000	\$125,000	\$125,000
Undivided profits.....	118,705	116,236	129,689	131,877
Circulation.....	3,092	3,092	3,092	3,092
Due depositors on demand.....	567,869	619,053	606,894	644,139
Due to trust companies, State, national and private banks and brokers.....	21,069	9,552	11,904	8,737
Add for cents.....	1	1	1	1
Total liabilities.....	\$835,736	\$872,934	\$876,580	\$912,846

ORIENTAL BANK — New York City.

WASHINGTON A. HALL, *President.*

(Organized 1883.)

CLINTON W. STARKEY, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,527,628	\$1,751,623	\$1,815,286	\$1,880,102
Due from directors.....	80,141	64,675	86,227	55,977
Overdrafts.....	352	1,849	2,670	406
Due from trust companies, State, national and private banks and brokers.....	18,876	194,019	206,300	180,183
Real estate.....	80,900	80,900	80,900	80,900
Stocks and bonds.....	130,425	159,350	179,800	177,800
Specie.....	32,336	29,063	28,258	26,817
United States legal tender notes and circulating notes of national banks.....	145,187	160,214	157,587	126,802
Cash items.....	183,136	100,843	65,112	107,261
Loss and expense account.....	13,407	4,785	11,581	4,705
Add for cents.....	3	2	2	3
Total resources.....	\$2,212,391	\$2,547,323	\$2,033,723	\$2,640,956
LIABILITIES.				
Capital.....	\$300,000	\$300,000	\$300,000	\$300,000
Surplus fund.....	150,000	150,000	150,000	150,000
Undivided profits.....	45,392	35,571	54,341	40,950
Due depositors on demand.....	1,718,026	2,060,247	2,076,558	2,032,864
Due to trust companies, State, national and private banks and brokers.....	.....	.....	51,907	42,246
Due individuals and corporations other than banks and depositors.....	.....	.....	.....	78,030
Amount due, not included in either of the above heads.....	8,972	1,505	917	1,864
Add for cents.....	1	.....	.....	2
Total liabilities.....	\$2,212,391	\$2,547,323	\$2,033,723	\$2,640,956

PACIFIC BANK — New York City. (Organized 1898.)

JACOB CAMPBELL, *President.*

ROBERT BUCK, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 31, 1898	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$2,329,498	\$2,406,315	\$2,515,496	\$2,314,334
Due from directors.....	9,296	31,812	7,507	7,204
Due from trust companies, State, national and private banks and brokers....	244,612	212,765	288,896	192,111
Real estate.....	76,268	76,268	76,268	76,268
Stocks and bonds.....	1,000	1,000	1,000	1,000
Specie.....	406,061	308,545	454,664	454,620
United States legal tender notes and circulating notes of national banks....	280,923	251,895	268,861	186,542
Cash items.....	218,950	364,225	251,147	305,184
Loss and expense account.....	5,571	4,455	5,673	5,678
Assets not included in either of the above heads.....	6,000	2,000	.....	8,000
Add for cents.....	1	2	1	3
Total resources.....	\$3,578,180	\$3,659,282	\$3,869,013	\$3,550,944

LIABILITIES.

Capital.....	\$422,700	\$422,700	\$422,700	\$422,700
Surplus fund.....	203,695	203,712	203,712	203,712
Undivided profits.....	28,879	32,468	41,003	39,699
Due depositors on demand.....	2,919,779	2,998,043	3,200,356	2,882,389
Amount due, not included in either of the above heads.....	2,126	2,357	1,241	2,442
Add for cents.....	1	2	1	2
Total liabilities.....	\$3,578,180	\$3,659,282	\$3,869,013	\$3,550,944

PEOPLE'S BANK — New York City.

CHARLES F. HUNTER, President.

(Organized 1851.)

WILLIAM MILNE, Jr., Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$1,208,537	\$1,186,756	\$1,254,173	\$1,320,241
Due from directors.....	139,001	77,834	72,029	111,715
Due from trust companies, State, national and private banks and brokers.....	235,694	133,604	201,159	177,326
Real estate.....	91,063	91,063	77,162	80,862
Bonds and mortgages.....	.....	.....	9,000	9,000
Stocks and bonds.....	122,886	122,886	122,886	184,738
Specie.....	66,381	393,183	193,632	192,613
United States legal tender notes and circulating notes of national banks.....	130,181	121,241	120,153	110,985
Cash items.....	104,530	125,005	167,179	108,920
Loss and expense account.....	13,554	5,933	14,638	5,713
Add for cents.....	4	4	2	3
Total resources.....	\$2,120,781	\$2,257,459	\$2,282,563	\$2,192,116
LIABILITIES.				
Capital.....	\$412,500	\$412,500	\$200,000	\$200,000
Surplus fund.....	112,120	112,658	104,884	105,727
Undivided profits.....	34,025	14,609	34,278	15,546
Circulation.....	5,415	5,415	5,415	5,415
Due depositors on demand.....	1,497,558	1,607,140	1,779,917	1,758,334
Due to trust companies, State, national and private banks and brokers.....	53,726	94,537	98,126	90,769
Amount due, not included in either of the above heads.....	5,434	10,598	9,941	16,322
Add for cents.....	3	2	2	3
Total liabilities.....	\$2,120,781	\$2,257,459	\$2,232,563	\$2,192,116

PACIFIC BANK — New York City.

JACOB CAMPBELL, *President.*

(Organized 1882.)

ROBERT BUCK, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$2,329,498	\$2,406,315	\$2,515,496	\$2,814,334
Due from directors.....	9,296	31,812	7,507	7,204
Due from trust companies, State, national and private banks and brokers....	244,612	212,765	288,396	192,111
Real estate.....	76,268	76,268	76,268	76,268
Stocks and bonds.....	1,000	1,000	1,000	1,000
Specie.....	406,061	308,545	454,664	454,620
United States legal tender notes and circulating notes of national banks....	280,923	251,895	208,861	186,542
Cash items.....	218,950	304,225	251,147	305,184
Loss and expense account.....	5,571	4,455	5,073	5,678
Assets not included in either of the above heads.....	6,000	2,000	.....	8,000
Add for cents.....	1	2	1	3
Total resources.....	\$3,578,180	\$3,659,282	\$3,869,013	\$3,550,944

LIABILITIES.

Capital.....	\$422,700	\$422,700	\$422,700	\$422,700
Surplus fund.....	203,695	203,712	203,712	203,712
Undivided profits.....	29,879	32,468	41,003	39,699
Due depositors on demand.....	2,919,779	2,908,043	3,200,356	2,882,389
Amount due, not included in either of the above heads.....	2,126	2,357	1,241	2,442
Add for cents.....	1	2	1	2
Total liabilities.....	\$3,578,180	\$3,659,282	\$3,869,013	\$3,550,944

PEOPLE'S BANK — New York City.

CHARLES F. HUNTER, President.

(Organized 1851.)

WILLIAM MILNE, Jr., Cashier.

RESOURCES.		Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors		\$1,208,537	\$1,186,756	\$1,254,173	\$1,320,241
Due from directors		139,001	77,854	72,639	111,715
Due from trust companies, State, national and private banks and brokers		285,094	183,604	201,159	177,326
Real estate		91,063	91,063	77,162	80,862
Bonds and mortgages		.....	.....	9,000	9,000
Stocks and bonds		122,836	122,836	122,836	134,738
Specie		66,381	893,183	193,632	132,613
United States legal tender notes and circulating notes of national banks		130,181	121,241	120,153	110,985
Cash items		104,530	125,005	167,179	108,920
Loss and expense account		18,554	5,933	14,638	5,713
Add for cents		4	4	2	3
Total resources		\$2,130,781	\$2,257,459	\$2,282,563	\$2,192,116
LIABILITIES.					
Capital		\$412,500	\$412,500	\$200,000	\$200,000
Surplus fund		112,120	112,558	104,884	105,727
Undivided profits		34,025	14,909	84,278	15,546
Circulation		5,415	5,415	5,415	5,415
Due depositors on demand		1,497,558	1,607,140	1,779,917	1,788,334
Due to trust companies, State, national and private banks and brokers		53,726	94,537	98,126	90,769
Amount due, not included in either of the above heads		5,434	10,598	9,941	16,322
Add for cents		3	2	2	3
Total liabilities		\$2,130,781	\$2,257,459	\$2,282,563	\$2,192,116

PHENIX BANK — Phenix.

E. G. HUTCHINSON, *President.*

(Organized 1888.)

E. MERRY, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$85,650	\$81,986	\$91,800	\$91,158
Due from directors.....	7,761	15,663	6,378	6,286
Overdrafts.....	1,009	646	715	389
Due from trust companies, State, national and private banks and brokers.....	21,302	13,002	10,181	16,143
Real estate.....	8,225	8,225	8,225	8,316
Bonds and mortgages.....	.....	1,446	1,446	1,446
Stocks and bonds.....	8,500	8,500	9,500	9,500
Specie.....	133	71	30	86
U. S. legal tender notes and circulating notes of national banks.....	1,807	407	4,193	1,743
Cash items.....	1,525	1,181	8,610	1,541
Loss and expense account.....	1,275	402	868	1,150
Assets not included in either of the above heads.....	1,171	8,259	4,551	4,620
Add for cents.....	5	8	3	4
Total resources.....	\$138,363	\$134,741	\$141,450	\$142,382
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	13,804	14,236	17,464	18,636
Due depositors on demand.....	71,168	66,398	69,811	69,821
Due to trust companies, State, national and private banks and brokers.....	724	1,163	338	67
Due individuals and corporations other than banks and depositors.....	2,400	2,942	8,836	8,857
Amount due, not included in either of the above heads.....	175	.....	.....	.....
Add for cents.....	2	2	1	1
Total liabilities.....	\$138,363	\$134,741	\$141,450	\$142,382

PRODUCE BANK — New York City. (Organized 1872.)

ALEXANDER F. RIACH, *Vice-President.*

N. O. SUYDAM, *Cashier.*

	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
RESOURCES.				
Loans and discounts less due from directors	\$396,085	\$302,771	\$309,000	\$326,318
Due from directors	14,877	15,591	15,522	62,959
Overdrafts	15,261	16,648	20,679	26,219
Due from trust companies, State, national and private banks and brokers	1,896	624	11,176	8,040
Stocks and bonds	7,392	7,392	7,392	7,392
Specie	2,651	2,985	2,053	4,487
United States legal tender notes and circulating notes of national banks	26,587	21,724	184,214	13,678
Cash items	26,988	71,127	47,855	91,657
Loss and expense account	8,747	16,232	22,647	28,954
Assets not included in either of the above heads	10,639	10,639	10,652	10,652
Add for cents	3	3	4	4
Total resources	\$411,076	\$465,686	\$631,294	\$580,360
LIABILITIES.				
Capital	\$125,000	\$125,000	\$125,000	\$125,000
Undivided profits	12,548	17,588	23,416	29,836
Due depositors on demand	234,942	222,513	394,293	386,939
Due to trust companies, State, national and private banks and brokers .....	.....	62,000	50,000	.....
Due individuals and corporations other than banks and depositors	38,584	38,584	38,584	38,584
Add for cents	2	1	1	1
Total liabilities	\$411,076	\$465,686	\$631,294	\$580,360

ROBERT GERE BANK—Syracuse.

JAMES J. BELDEN, President.

(Organized 1880.)

FREDERICK W. BARKER, Cashier.

RESOURCES.		Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....		\$359,640	\$465,562	\$413,176	\$431,528
Due from directors		3,600	300	334	2,663
Overdrafts		47,179	95,585	59,761	83,258
Due from trust companies, State, national and private banks and brokers.....		1,000	20,250	1,000	1,000
Stocks and bonds		2,923	1,932	1,648	6,429
Specie		10,643	10,027	5,117	17,704
U. S. legal tender notes and circulating notes of national banks.....		1,177	4,589	8,017	7,458
Cash items		5,144	7,939	598	3,537
Loss and expense account		2	3	3	2
Add for cents					
Total resources.....		\$431,397	\$606,207	\$484,654	\$553,579
LIABILITIES.					
Capital.....		\$100,000	\$100,000	\$100,000	\$100,000
Surplus Fund.....		13,063	19,254	14,214	14,214
Undivided profits		316,015	344,346	2,417	10,247
Due depositors on demand		2,319	7,346	357,647	416,413
Due to trust companies, State, national and private banks and brokers.....			135,259	9,604	10,209
Due individuals and corporations other than banks and depositors					
Due Treasurer of the State of New York				770	2,494
Add for cents			2	2	2
Total liabilities		\$431,397	\$606,207	\$484,654	\$553,579

BANK OF ROCHESTER — Rochester.

J. MORGAN SMITH, Vice-President.

(Organized 1873.)

T. W. WHITTLESEY, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$532,763	\$504,402	\$559,764	\$544,347
Due from directors	49,086	26,612	57,920	103,393
Overdrafts	1,395	4,208	8,557	4,231
Due from trust companies, State, national and private banks and brokers	24,461	111,679	37,436	47,148
Real estate	4,636	5,207	5,207	5,332
Bonds and mortgages	4,500	4,500	4,500	4,500
Stocks and bonds	1,000	1,000	1,000	1,000
Specie	2,504	3,631	5,264	18,487
United States legal tender notes and circulating notes of national banks	18,355	16,248	23,878	10,756
Cash items	6,784	2,532	13,628	17,049
Loss and expense account	6,815	3,916	6,240	5,308
Assets not included in either of the above heads	2,560	2,560	2,560	2,560
Add for cents	5	5	3	3
Total resources	\$654,864	\$686,500	\$720,966	\$764,113
LIABILITIES.				
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits	32,779	24,563	36,218	33,767
Due depositors on demand	401,519	460,981	484,645	507,602
Due to trust companies, State, national and private banks and brokers	10,962	1,996	101	21,494
Amount due, not included in either of the above heads	9,602	159	.....	1,250
Add for cents	2	1	2	.....
Total liabilities	\$654,864	\$686,500	\$720,966	\$764,113

SARATOGA COUNTY BANK — Waterford.

O. BOUGHTON, President.

(Organized 1871.)

PERRY EMIGH, Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1890.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$198,798	\$201,319	\$189,295	\$195,849
Due from directors.....	6,764	11,223	3,227	8,404
Overdrafts.....	51	310	1,615	466
Due from trust companies, State, national and private banks and brokers.....	9,037	13,467	9,329	20,696
Real estate.....	33,110	35,735	35,735	35,735
Bonds and mortgages.....	1,000	1,000	1,000	1,000
Stocks and bonds.....	70,000	70,000	70,850	70,850
Specie.....	2,339	2,449	2,412	2,386
United States legal tender notes and circulating notes of national banks.....	9,151	9,778	8,985	5,371
Cash items.....	445	92	72	837
Loss and expense account.....	2,091	1,686	2,435	1,009
Add for cents.....	2	2	1	3
Total resources.....	\$335,808	\$347,061	\$324,956	\$342,606
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund.....	50,000	50,000	50,000	50,000
Undivided profits.....	13,706	11,581	8,907	5,373
Due depositors on demand.....	145,767	165,275	155,850	172,763
Due to trust companies, State, national and private banks and brokers.....	8,848	7,159	7,642	7,429
Due Treasurer of the State of New York.....	17,475	13,000	2,534	6,806
Amount due, not included in either of the above heads.....	11	42	21	233
Add for cents.....	1	1	2	2
Total liabilities.....	\$335,808	\$347,061	\$324,956	\$342,606

SCHENECTADY BANK — Schenectady.

A. A. VAN VORST, *President.*

(Organized 1881.)

W. L. GOODRICH, *Cashier.*

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 22, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
	\$	\$	\$	\$
Loans and discounts less due from directors.....	\$298,586	\$280,800	\$284,888	\$277,152
Due from directors.....	9,000	9,000	8,000	6,812
Overdrafts.....	1,575	1,193	67	73
Due from trust companies, State, national and private banks and brokers.....	31,313	78,774	69,610	68,916
Real estate.....	8,720	8,100	8,100	8,100
Bonds and mortgages.....	1,800	1,800	1,800	1,800
Stocks and bonds.....	25,225	25,225	25,225	25,225
Specie.....	4,660	4,905	11,380	4,330
United States legal tender notes and circulating notes of national banks.....	11,821	10,452	18,882	19,648
Cash items.....	6,921	4,421	10,507	7,895
Loss and expense account.....	625	.....	625	.....
Add for cents.....	1	2	2	1
Total resources.....	\$400,247	\$424,672	\$439,086	\$419,952
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits.....	47,051	42,761	48,790	46,410
Due depositors on demand.....	251,957	279,772	289,781	272,719
Due to trust companies, State, national and private banks and brokers.....	755	1,455	.....	.....
Amount due, not included in either of the above heads.....	482	682	565	822
Add for cents.....	2	2	.....	1
Total liabilities.....	\$400,247	\$424,672	\$439,086	\$419,952

BANK OF SKANEATELES—Skaneateles.

C. W. ALLIS, President.

(Organized 1889.)

B. F. PETHERAM, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$121,584	\$151,484	\$148,163	\$138,091
Due from directors	6,596	5,036	9,620	33,632
Overdrafts .....	.....	170	74	.....
Due from trust companies, State, national and private banks and brokers.....	67,076	27,714	29,225	12,310
Bonds and mortgages.....	.....	.....	.....	9,000
Stocks and bonds .....	.....	.....	.....	.....
Specie	1,000	1,000	1,000	1,000
United States legal tender notes and circulating notes of national banks	1,327	1,830	2,315	293
Cash items	2,518	3,307	1,408	4,618
Loss and expense account	420	495	358	575
Assets not included in either of the above heads.....	871	502	1,262	326
Add for cents	2,046	2,000	1,500	1,500
	2	2	4	1
Total resources	\$204,065	\$193,540	\$194,929	\$201,348
LIABILITIES.				
Capital.....	\$60,000	\$60,000	\$60,000	\$60,000
Undivided profits	7,795	6,607	7,246	5,744
Due depositors on demand.....	114,605	111,885	111,557	117,558
Due to trust companies, State, national and private banks and brokers.....	15,525	14,841	16,125	17,165
Due individuals and corporations other than banks and depositors.....	6,139	206	.....	881
Add for cents	1	1	1	.....
Total liabilities.....	\$204,065	\$193,540	\$194,929	\$201,348

STATE BANK — Chatham.

GEORGE L. MORRIS, President.

(Organized 1875.)

Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$80,835	\$31,599	\$97,805	\$126,945
Due from directors.....	15,360	15,916	14,332	16,402
Due from trust companies, State, national and private banks and brokers.....	71,403	83,317	40,725	81,198
Stocks and bonds.....	13,000	13,000	13,000	13,000
Specie.....	741	366	760	1,020
United States legal tender notes and circulating notes of national banks.....	4,637	5,289	5,370	7,592
Cash items.....	862	1,554	2,416	1,667
Loss and expense account.....	2,390	.....	726	1,891
Assets not included in either of the above heads.....	1,505	1,444	1,240	1,240
Add for cents.....	1	1	1	2
Total resources.....	\$196,734	\$202,486	\$176,275	\$200,942
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	14,287	10,657	12,919	15,832
Due to depositors on demand.....	113,811	131,830	105,245	125,658
Due to trust companies, State, national and private banks and brokers.....	18,035	8,846	8,062	9,422
Amount due, not included in either of the above heads.....	.....	1,152	28	28
Add for cents.....	1	1	1	2
Total liabilities.....	\$196,734	\$202,486	\$176,275	\$200,942

BANK OF SKANEATELES — Skaneateles.

C. W. ALLIS, *President.*

(Organized 1886.)

B. F. PETHERAM, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$121,584	\$151,484	\$148,163	\$138,091
Due from directors	6,596	5,036	9,620	83,632
Overdrafts .....	.....	170	74	.....
Due from trust companies, State, national and private banks and brokers.....	67,076	27,714	29,225	12,310
Bonds and mortgages.....	.....	.....	.....	9,000
Stocks and bonds	1,000	1,000	1,000	1,000
Specie.....	1,327	1,830	2,315	295
United States legal tender notes and circulating notes of national banks	2,513	3,307	1,408	4,618
Cash items	420	495	358	575
Loss and expense account	871	502	1,262	326
Assets not included in either of the above heads.....	2,046	2,000	1,500	1,500
Add for cents.....	2	2	4	1
Total resources	\$204,065	\$193,540	\$194,920	\$201,348
LIABILITIES.				
Capital.....	\$60,000	\$60,000	\$60,000	\$60,000
Undivided profits	7,795	6,607	7,248	5,744
Due depositors on demand.....	114,605	111,885	111,557	117,558
Due to trust companies, State, national and private banks and brokers.....	15,525	14,841	16,125	17,165
Due individuals and corporations other than banks and depositors.....	6,139	206	.....	881
Add for cents.....	1	1	1	.....
Total liabilities.....	\$204,065	\$193,540	\$194,920	\$201,348

STATE BANK — Chatham.

GEORGE L. MORRIS, President.

(Organized 1875.)

Cashier.

RESOURCES.	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$80,835	\$81,599	\$97,805	\$126,945
Due from directors	15,360	15,916	14,232	16,402
Due from trust companies, State, national and private banks and brokers...	71,403	88,317	40,725	81,198
Stocks and bonds	13,000	13,000	13,000	13,000
Specie	741	866	760	1,020
United States legal tender notes and circulating notes of national banks	4,637	5,289	5,370	7,592
Cash items	862	1,554	2,416	1,657
Loss and expense account	2,390	.....	726	1,891
Assets not included in either of the above heads.....	1,505	1,444	1,240	1,240
Add for cents.....	1	1	1	2
Total resources.....	\$196,734	\$202,486	\$176,275	\$200,942
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits	14,287	10,657	12,919	15,832
Due depositors on demand	113,811	131,830	105,245	125,658
Due to trust companies, State, national and private banks and brokers....	18,635	8,846	8,082	9,422
Amount due, not included in either of the above heads .....	.....	1,152	28	28
Add for cents.....	1	1	1	2
Total liabilities.....	\$196,734	\$202,486	\$176,275	\$200,942

BANK OF SKANEATELES — Skaneateles.

C. W. ALLIS, *President.*

(Organized 1866.)

D. F. PETHERAM, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$121,584	\$151,484	\$148,163	\$138,001
Due from directors	6,596	5,036	9,620	83,632
Overdrafts .....	.....	170	74	.....
Due from trust companies, State, national and private banks and brokers.....	67,076	27,714	29,225	12,310
Bonds and mortgages .....	.....	.....	.....	9,000
Stocks and bonds	1,000	1,000	1,000	1,000
Specie.....	1,327	1,830	2,315	295
United States legal tender notes and circulating notes of national banks	2,513	3,307	1,408	4,618
Cash items	420	495	358	575
Loss and expense account	871	502	1,262	326
Assets not included in either of the above heads.....	2,046	2,000	1,500	1,500
Add for cents.....	2	2	4	1
Total resources	\$204,065	\$193,540	\$194,929	\$201,348
LIABILITIES.				
Capital.....	\$60,000	\$60,000	\$60,000	\$60,000
Undivided profits	7,795	6,607	7,246	5,744
Due depositors on demand.....	114,605	111,885	111,557	117,558
Due to trust companies, State, national and private banks and brokers.....	15,525	14,841	16,125	17,165
Due individuals and corporations other than banks and depositors.....	6,139	206	.....	881
Add for cents.....	1	1	1	.....
Total liabilities.....	\$204,065	\$193,540	\$194,929	\$201,348

STATE BANK — Chatham.

GEORGE L. MORRIS, President.

(Organized 1875.)

Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$86,885	\$81,599	\$97,805	\$126,945
Due from directors.....	15,360	15,916	14,232	16,402
Due from trust companies, State, national and private banks.....	71,403	83,317	40,725	81,198
Stocks and bonds.....	13,000	13,000	13,000	13,000
Specie.....	741	866	760	1,020
United States legal tender notes and circulating notes of national banks.....	4,637	5,289	5,970	7,592
Cash items.....	862	1,554	2,416	1,657
Loss and expense account.....	2,390	.....	726	1,891
Assets not included in either of the above heads.....	1,505	1,444	1,240	1,240
Add for cents.....	1	1	1	2
Total resources.....	\$196,734	\$202,486	\$176,275	\$200,942
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	14,287	10,657	12,919	15,832
Due depositors on demand.....	113,811	131,830	105,245	125,658
Due to trust companies, State, national and private banks.....	18,635	8,846	8,082	9,422
Amount due, not included in either of the above heads.....	.....	1,152	28	28
Add for cents.....	1	1	1	2
Total liabilities.....	\$196,734	\$202,486	\$176,275	\$200,942

STATE BANK OF FORT EDWARD.

DAVID UNDERWOOD, *President.*

(Organized 1871.)

GEORGE CLEMENTS, *Cashier.*

	RESOURCES.			
	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$116,279	\$115,733	\$115,494	\$119,185
Due from directors.....	18,161	19,864	20,264	16,741
Overdrafts.....	2,129	8,146	2,794	1,382
Due from trust companies, State, national and private banks and brokers.....	3,730	3,898	6,611	4,689
Real estate.....	4,829	4,829	4,829	4,829
Bonds and mortgages.....	2,200	2,200	2,200	2,200
Stocks and bonds.....	1,000	1,000	1,000	1,000
Specie.....	1,473	2,238	2,570	8,258
United States legal tender notes and circulating notes of national banks.....	3,629	3,066	6,798	5,373
Cash items.....	4,967	5,218	7,653	7,019
Loss and expense account.....	4,409	5,989	4,056	4,266
Assets not included in either of the above heads.....	1,578	1,578	1,578	1,578
Add for cents.....	3	3	3	3
Total resources.....	\$164,377	\$168,762	\$175,850	\$171,503
LIABILITIES.				
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	20,802	20,062	21,771	18,546
Due depositors on demand.....	74,908	80,005	83,308	84,280
Due to trust companies, State, national and private banks and brokers.....	4,719	2,660	2,529	5,738
Amount due, not included in either of the above heads.....	13,947	16,034	18,240	12,988
Add for cents.....	1	1	2	1
Total liabilities.....	\$164,377	\$168,762	\$175,850	\$171,503

STATE BANK OF RANDOLPH.

WILLIAM H. HENDERSON, President.

(Organized 1874.)

CHARLES ADAMS, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$238,118	\$255,927	\$286,965	\$265,108
Overdrafts.....	6,097	4,022	1,758	8,016
Due from trust companies, State, national and private banks and brokers.....	37,059	25,850	21,175	42,386
Real estate.....	7,950	7,950	7,950	7,950
Stocks and bonds.....	5,000	5,000	5,000	5,000
Specie.....	4,510	2,780	4,500	10,177
United States legal tender notes and circulating notes of national banks.....	6,302	3,919	3,500	7,219
Cash items.....	4,181	2,557	549	560
Loss and expense account.....	3,403	1,247	2,640	1,527
Assets not included in either of the above heads.....	2,121	2,117	2,117	2,117
Add for cents.....	8	5	2	2
Total resources.....	\$814,744	\$811,324	\$886,156	\$845,057
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund.....	8,994	10,900	10,000	11,000
Undivided profits.....	9,613	4,499	9,775	4,335
Due depositors on demand.....	192,638	194,889	214,085	225,924
Due to trust companies, State, national and private banks and brokers.....	3,502	1,934	2,345	4,098
Add for cents.....	2	2	1	.....
Total liabilities.....	\$814,744	\$811,324	\$886,156	\$845,057

STATE BANK OF SYRACUSE.

GEORGE BARNES, President.

(Organized 1873.)

JONATHAN C. CHASE, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1890.	Statement of condition, March 12, 1891.	Statement of condition, June 18, 1891.	Statement of condition, Sept. 24, 1891.
Loans and discounts less due from directors.....	\$575,724	\$664,748	\$707,843	\$683,142
Overdrafts.....	919	369	87	85
Due from trust companies, State, national and private banks and brokers ..	23,309	41,354	40,318	20,234
Real estate	14,470	14,236	13,990	13,859
Stocks and bonds	6,000	1,000	1,000	1,000
Specie	280	553	1,445	937
United States legal tender notes and circulating notes of national banks ..	5,656	5,743	11,566	5,206
Cash items	3,783	3,403	3,220	3,903
Loss and expense account	8,448	1,928	8,733	1,050
Assets not included in either of the above heads.....	5,731	4,731	4,731	4,731
Add for cents	8	2	3	3
Total resources	\$639,273	\$737,527	\$877,936	\$734,150
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Undivided profits	31,519	34,178	44,180	19,550
Due depositors on demand	63,206	85,943	120,490	178,163
Due to trust companies, State, national and private banks and brokers	444,484	517,340	613,191	436,349
Amount due, not included in either of the above heads	63	64	64	87
Add for cents	1	2	1	2
Total liabilities	\$639,273	\$737,527	\$877,936	\$734,150

ST. LAWRENCE COUNTY BANK — Canton.

W. H. KIMBALL, President.

(Organized 1881.)

S. D. KIMBALL, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$108,381	\$141,190
Due from directors	254
Overdrafts	416	830
Due from trust companies, State, national and private banks and brokers	15,212	7,853
Real estate	5,500	5,500
Stocks and bonds	1,000	1,000
Specie	1,209	1,283
United States legal tender notes and circulating notes of national banks	7,527	9,568
Cash items	829	948
Assets not included in either of the above heads	2,100	2,100
Add for cents	2	2
Total resources	\$142,176	\$169,523
LIABILITIES.				
Capital	\$50,000	\$50,000
Undivided profits	1,055	2,624
Due depositors on demand	89,839	116,065
Due to trust companies, State, national and private banks and brokers	1,781	812
Add for cents	1	1
Total liabilities	\$142,176	\$169,523

SUSQUEHANNA VALLEY BANK — Binghamton.

ROBERT A. CLARK, President.

(Organized 1855.)

JAMES W. MANIER, Cashier.

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$295,071	\$846,175	\$356,963	\$305,926
Due from directors.....	13,281	12,814	21,876	24,384
Overdrafts.....	18,889	442	1,092	2,948
Due from trust companies, State, national and private banks and brokers.....	124,566	59,254	131,073	98,186
Real estate.....	1,500	.....	.....	.....
Bonds and mortgages.....	80,000	84,460	84,460	84,460
Stocks and bonds.....	40,000	40,000	40,000	40,000
Specie.....	5,876	8,740	8,704	8,438
United States legal tender notes and circulating notes of national banks.....	11,455	16,101	9,897	13,061
Cash items.....	2,517	3,601	2,855	3,137
Loss and expense account.....	3,410	1,267	3,778	1,469
Assets not included in either of the above heads.....	21,901	9,424	9,415	9,195
Add for cents.....	3	1	2	3
Total resources.....	\$618,409	\$582,279	\$664,115	\$591,207
LIABILITIES.				
Capital.....	\$100,000	\$100,000	\$100,000	\$100,000
Surplus fund.....	25,000	30,000	30,000	35,000
Undivided profits.....	19,485	17,223	26,428	16,176
Circulation.....	3,232	.....	.....	.....
Due depositors on demand.....	432,375	403,315	481,864	404,865
Due to trust companies, State, national and private banks and brokers.....	38,251	31,740	25,821	35,144
Amount due, not included in either of the above heads.....	04	.....	.....	.....
Add for cents.....	2	1	2	2
Total liabilities.....	\$618,409	\$582,279	\$664,115	\$591,207

UNION BANK OF MEDINA.

(Organized 1861.)

WILLIAM H. WATSON, President.

E. CHAPIN BENNETT, Cashier.

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$94,399	\$98,172	\$88,813	\$98,933
Due from directors.....	5,000	.....	5,000	5,000
Overdrafts.....	118	32	709	355
Due from trust companies, State, national and private banks and brokers.....	12,552	17,073	9,284	10,201
Real estate.....	7,000	5,000	5,000	8,500
Bonds and mortgages.....	13,059	14,259	12,659	9,159
Stocks and bonds.....	5,575	5,575	5,575	5,575
Specie.....	1,877	1,104	2,621	1,324
United States legal tender notes and circulating notes of national banks.....	8,804	6,495	8,997	5,175
Cash items.....	210	1,558	119	720
Loss and expense account.....	1,717	769	2,004	808
Assets not included in either of the above heads.....	2,060	2,023	2,155	2,090
Add for cents.....	2	4	4	2
Total resources.....	\$152,373	\$152,064	\$142,940	\$147,842

LIABILITIES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Capital.....	\$50,000	\$50,000	\$50,000	\$50,000
Undivided profits.....	12,461	11,562	14,073	12,270
Circulation.....	1,001	1,001	1,001	1,001
Due depositors on demand.....	85,873	88,453	76,231	83,673
Due to trust companies, State, national and private banks and brokers.....	2,460	837	1,431	589
Due individuals and corporations other than banks and depositors.....	577	210	202	357
Add for cents.....	1	1	2	2
Total liabilities.....	\$152,373	\$152,064	\$142,940	\$147,842

WEST SIDE BANK — New York City.

GEORGE MOORE, *President.*

(Organized 1880.)

JOHN W. B. DOBLER, *Cashier.*

RESOURCES.	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$1,545,335	\$1,623,591	\$1,610,754	\$1,699,882
Due from directors.....	19,775	16,750	12,825	25,700
Overdrafts.....	4,000	7,155	3	1
Due from trust companies, State, national and private banks and brokers.....	289,604	306,751	630,961	403,796
Stocks and bonds.....	66,000	66,000	66,000	65,000
Specie.....	19,644	25,858	32,638	49,162
United States legal tender notes and circulating notes of national banks.....	148,145	159,891	150,942	173,624
Cash items.....	13,049	11,344	10,993	27,608
Loss and expense account.....	22,528	9,118	21,452	9,786
Assets not included in either of the above heads.....	295	400	.....	420
Add for cents.....	1	2	2	8
Total resources.....	\$2,128,376	\$2,226,860	\$2,536,570	\$2,454,932
LIABILITIES.				
Capital.....	\$200,000	\$200,000	\$200,000	\$200,000
Surplus fund.....	100,000	100,000	115,800	114,963
Undivided profits.....	53,590	33,667	44,106	21,537
Due depositors on demand.....	1,766,695	1,891,429	2,172,089	2,112,487
Amount due, not included in either of the above heads.....	6,090	2,364	4,483	5,924
Add for cents.....	1	.....	2	1
Total liabilities.....	\$2,138,376	\$2,226,860	\$2,536,570	\$2,454,932

WHITE'S BANK OF BUFFALO.

JAMES D. SAWYER, *President.*

(Organized 1833)

ELISHA T. SMITH, *Cashier.*

RESOURCES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$840,543	\$852,887	\$888,950	\$778,193
Due from directors	21,000	16,000	17,300	10,000
Overdrafts	1,304	2,752	2,536	2,552
Due from trust companies, State, national and private banks and brokers	42,514	60,470	128,249	284,954
Real estate	17,518	28,696	23,696	23,696
Bonds and mortgages	4,478	.....	.....	.....
Stocks and bonds	6,080	6,080	6,080	6,080
Specie	14,906	24,232	14,061	13,291
United States legal tender notes and circulating notes of national banks	26,132	20,324	28,475	28,745
Cash items	930	758	849	1,053
Loss and expense account	.....	528	.....	528
Assets not included in either of the above heads	2,570	1,993	2,522	1,993
Add for cents	4	4	3	4
Total resources	\$977,999	\$1,018,674	\$1,057,721	\$1,151,059

LIABILITIES.

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Capital	\$200,000	\$200,000	\$200,000	\$200,000
Undivided profits	50,365	37,778	50,668	40,997
Due depositors on demand	505,542	544,980	580,824	640,815
Due to trust companies, State, national and private banks and brokers	148,472	162,386	145,654	171,226
Due Treasurer of the State of New York	73,619	73,619	80,574	98,020
Add for cents	1	2	1	1
Total liabilities	\$977,999	\$1,018,674	\$1,057,721	\$1,151,059

SUMMARY showing the Aggregate Resources and Liabilities of the Banks of the State of New York, as exhibited by their reports to the Bank Department, of their condition on the several dates named below.

	RESOURCES.			
	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors.....	\$64,810,228	\$67,148,546	\$73,558,723	\$74,745,135
Due from directors.....	2,692,198	2,453,316	2,370,788	3,084,151
Overdrafts.....	128,241	98,708	86,030	105,011
Due from trust companies, State, national and private banks and brokers.....	8,131,714	6,893,407	9,874,934	8,587,787
Real estate.....	2,236,987	2,201,123	2,042,457	2,038,633
Bonds and mortgages.....	358,061	354,862	375,418	385,725
Stocks and bonds.....	3,160,434	3,697,320	8,751,291	8,950,568
Specie.....	4,356,545	5,332,365	5,297,500	5,293,929
United States legal tender notes and circulating notes of national banks.....	3,909,951	3,851,714	5,237,352	4,617,703
Cash items.....	17,031,612	15,445,122	16,984,077	10,082,059
Loss and expense account.....	469,104	291,479	487,450	345,549
Assets not included in either of the above heads.....	163,424	128,481	241,336	277,078
Add for cents.....	225	226	228	244
Total resources.....	\$107,448,724	\$107,886,669	\$120,307,584	\$118,463,572
LIABILITIES.				
Capital.....	\$18,738,200	\$18,838,200	\$19,025,700	\$19,025,700
Surplus fund.....	4,908,519	4,932,150	5,047,293	5,095,147
Undivided profits.....	3,918,746	3,470,212	4,278,118	3,833,028
Circulation.....	37,513	34,271	83,926	83,926
Due depositors on demand.....	70,288,946	71,018,561	80,619,134	75,717,130
Due to trust companies, State, national and private banks and brokers.....	7,412,122	7,737,977	9,574,285	7,589,383
Due individuals and corporations other than banks and depositors.....	624,373	736,275	648,832	877,694
Due Treasurer of the State of New York.....	436,040	631,562	664,460	756,887
Amount due, not included in either of the above heads.....	1,084,134	507,346	415,689	534,550
Add for cents.....	131	115	127	127
Total liabilities.....	\$107,448,724	\$107,886,669	\$120,307,584	\$118,463,572

AGGREGATE of resources and liabilities of State banks in the city of New York, as shown by the reports of their condition on the
several dates named below.

107

	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
RESOURCES.				
Loans and discounts less due from directors	\$39,776,985	\$42,023,147	\$46,898,077	\$45,939,554
Due from directors	1,790,871	1,520,248	1,332,328	1,719,185
Overdrafts	50,123	40,390	39,448	46,503
Due from trust companies, State, national and private banks and brokers	3,621,656	2,624,064	3,976,717	3,035,266
Real estate	1,492,030	1,412,183	1,233,285	1,235,514
Bonds and mortgages	47,810	44,988	56,048	55,088
Stocks and bonds	765,468	1,009,699	1,081,073	1,094,856
Specie	4,032,884	5,002,832	5,000,498	4,985,820
United States legal tender notes and circulating notes of national banks	2,963,057	2,945,663	4,115,663	3,444,409
Cash items	16,523,344	14,846,812	16,492,957	9,718,855
Loss and expense account	246,475	150,892	260,395	168,138
Assets not included in either of the above heads	79,922	56,974	62,420	80,756
Add for cents	54	58	54	62
Total resources	\$71,349,879	\$71,677,869	\$80,498,963	\$71,524,001
LIABILITIES.				
Capital	\$11,500,200	\$11,600,200	\$11,387,700	\$11,387,700
Surplus fund	3,211,178	3,232,625	3,315,502	3,341,461
Undivided profits	2,424,954	2,194,630	2,629,563	2,403,066
Circulation	17,966	17,956	17,611	17,611
Due depositors on demand	48,178,541	48,427,127	55,517,367	48,627,455
Due to trust companies, State, national and private banks and brokers	5,684,218	5,902,750	7,321,261	5,300,654
Due individuals and corporations other than banks and depositors	89,922	84,061	72,194	143,637
Due Treasurer of the State of New York	11,876	42,943	64,126	50,713
Amount due, not included in either of the above heads	230,993	175,552	173,612	251,678
Add for cents	81	25	27	26
Total liabilities	\$71,349,879	\$71,677,869	\$80,498,963	\$71,524,001

AGGREGATE of resources and liabilities of the city of New York, as shown by the reports of their condition on the several dates named below.

	RESOURCES.			
	Statement of condition, Dec. 11, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$24,949,512	\$25,050,992	\$26,576,419	\$28,722,360
Due from directors	900,439	932,552	1,036,454	1,311,651
Overdrafts	77,765	58,234	46,452	58,494
Due from trust companies, State, national and private banks and brokers	4,471,824	4,202,700	5,881,089	5,521,882
Real estate	804,457	788,441	805,672	799,619
Bonds and mortgages	309,424	308,397	318,370	329,637
Stocks and bonds	2,382,204	2,681,221	2,713,068	2,848,562
Specie	302,141	327,062	294,880	306,418
United States legal tender notes and circulating notes of national banks	942,649	894,842	1,114,595	1,170,460
Cash items	508,189	597,316	490,193	362,780
Loss and expense account	222,235	139,588	225,605	175,685
Assets not included in either of the above heads	83,342	71,407	178,816	196,222
Add for cents	132	130	135	141
Total resources	\$35,954,403	\$36,032,882	\$39,681,748	\$41,803,911
LIABILITIES.				
Capital	\$7,203,000	\$7,203,000	\$7,603,000	\$7,603,000
Surplus fund	1,697,241	1,690,425	1,731,691	1,753,586
Undivided profits	1,492,699	1,273,401	1,644,872	1,424,651
Circulation	19,241	16,009	16,009	16,009
Due depositors on demand	22,005,984	22,476,380	25,024,577	27,003,064
Due to trust companies, State, national and private banks and brokers	1,724,419	1,823,978	2,248,736	2,285,567
Due individuals and corporations other than banks and depositors	534,451	642,214	576,038	734,057
Due Treasurer of the State of New York	424,164	588,619	600,334	706,174
Amount due, not included in either of the above heads	853,141	329,794	235,827	277,741
Add for cents	63	56	64	62
Total liabilities	\$35,954,403	\$36,052,882	\$39,681,748	\$41,803,911

TABLE No. 12.

COMPARATIVE STATEMENT of sundry items of resources and liabilities of the State banks, as shown by their reports for the last quarter in each year, since the passage of the act of the Legislature enabling the conversion of State banks into national banks, passed March 9, 1865.

DATE.	Capital.	Due depositors on demand.	Loans and discounts.	Specie.	Profits and surplus.	Total resources.	No. of banks.
September 30, 1865	\$20,436,970	\$43,164,881	\$37,886,884	\$3,162,220	\$5,183,633	\$87,185,722	113
September 23, 1866	15,443,477	40,573,591	37,450,710	1,538,194	4,579,440	72,632,003	85
September 23, 1867	14,696,189	34,954,790	35,413,421	1,781,591	5,125,640	61,133,681	61
September 23, 1868	14,578,280	40,980,922	39,455,487	2,150,393	5,758,181	67,896,819	44
September 23, 1869	18,205,924	60,517,891	47,743,597	1,397,744	6,805,689	92,852,091	55
September 24, 1870	19,759,810	40,535,437	46,435,980	1,874,662	7,384,299	78,281,601	59
August 24, 1871	23,061,020	61,908,371	56,318,789	2,162,584	7,628,050	100,421,820	69
September 21, 1872	24,845,980	76,491,383	66,076,391	1,361,773	8,624,172	117,858,811	70
September 13, 1873	26,958,890	70,783,491	71,073,544	2,916,213	9,256,782	116,638,734	80
September 24, 1874	29,336,290	62,471,306	66,435,729	1,849,559	9,754,838	111,180,340	81
September 18, 1875	24,915,090	61,894,967	68,191,919	1,815,256	9,504,764	107,107,918	84
September 23, 1876	24,463,317	56,774,912	63,082,801	1,609,943	8,586,086	100,759,644	84
September 23, 1877	23,739,100	54,002,718	57,906,952	2,130,069	7,702,800	98,385,429	81
September 21, 1878	20,568,200	50,540,621	51,628,029	1,744,534	7,230,252	88,655,670	75
September 13, 1879	19,363,900	52,259,589	61,174,579	1,587,220	7,238,495	88,683,182	73
September 18, 1880	18,738,200	61,795,773	68,179,259	5,231,764	8,058,180	99,880,755	68
September 24, 1881	19,025,700	75,717,130	74,746,133	5,238,929	8,828,175	113,463,572	72

AGGREGATE of resources and liabilities of State banks outside of the city of New York, as shown by the reports of their condition on the several dates named below.

	RESOURCES.			
	Statement of condition, Dec. 31, 1880.	Statement of condition, March 12, 1881.	Statement of condition, June 18, 1881.	Statement of condition, Sept. 24, 1881.
Loans and discounts less due from directors	\$24,949,512	\$25,050,992	\$26,576,419	\$28,722,860
Due from directors	900,439	932,552	1,036,454	1,311,651
Overdrafts	77,765	58,234	46,452	58,494
Due from trust companies, State, national and private banks and brokers	- 4,471,824	4,202,700	5,881,069	5,521,882
Real estate	804,457	788,441	805,672	799,619
Bonds and mortgages	309,424	308,397	318,370	329,637
Stocks and bonds	2,382,294	2,681,221	2,713,068	2,848,562
Specie	302,141	327,062	294,880	306,418
United States legal tender notes and circulating notes of national banks	942,649	894,842	1,114,595	1,179,460
Cash items	508,189	597,316	490,193	362,780
Loss and expense account	222,235	139,588	225,605	175,685
Assets not included in either of the above heads	83,342	71,407	178,816	196,222
Add for cents	132	130	135	141
Total resources	\$85,954,403	\$86,032,882	\$89,681,748	\$41,803,911
LIABILITIES.				
Capital	\$7,203,000	\$7,203,000	\$7,603,000	\$7,603,000
Surplus fund	1,697,241	1,699,425	1,731,691	1,753,586
Undivided profits	1,492,699	1,273,401	1,644,872	1,434,651
Circulation	19,241	16,009	16,009	16,009
Due depositors on demand	22,005,984	22,476,386	25,024,577	27,003,064
Due to trust companies, State, national and private banks and brokers	1,724,419	1,823,978	2,248,736	2,285,567
Due individuals and corporations other than banks and depositors	534,451	642,214	576,638	734,057
Due Treasurer of the State of New York	424,164	588,619	600,334	706,174
Amount due, not included in either of the above heads	853,141	329,794	235,827	277,741
Add for cents	63	56	64	62
Total liabilities	\$85,954,403	\$86,052,882	\$89,681,748	\$41,803,911

TABLE No. 12.
COMPARATIVE STATEMENT of sundry items of resources and liabilities of the State banks, as shown by their reports for the last quarter in each year, since the passage of the act of the Legislature enabling the conversion of State banks into national banks, passed March 9, 1865.

DATE.	Capital.	Due depositors on demand.	Loans and discounts.	Specie.	Profits and surplus.	Total resources.	No. of banks.
September 30, 1865	\$20,456,970	\$43,164,881	\$37,886,884	\$3,162,230	\$5,188,633	\$57,195,792	113
September 29, 1866	15,443,477	40,573,591	37,420,710	1,538,194	4,579,440	72,632,003	85
September 28, 1867	14,696,189	34,684,780	35,413,421	1,781,591	5,125,540	61,133,661	61
September 26, 1868	14,578,280	40,980,822	39,465,487	2,150,393	5,768,181	67,896,319	44
September 25, 1869	18,205,924	00,517,891	47,743,597	1,897,744	6,805,689	62,392,091	55
September 24, 1870	19,759,810	46,535,437	46,435,990	1,874,632	7,384,290	76,281,601	59
August 23, 1871	23,081,020	61,908,371	56,318,739	2,162,584	7,628,050	100,421,820	69
September 21, 1872	24,845,040	75,491,363	66,076,361	1,361,773	8,024,172	117,858,811	70
September 19, 1873	26,938,800	70,783,491	71,073,544	2,916,213	9,256,782	116,538,784	80
September 24, 1874	29,386,290	62,471,306	66,435,729	1,849,559	9,754,888	111,180,340	81
September 18, 1875	24,915,090	61,894,987	68,191,919	1,815,256	9,504,764	107,071,918	84
September 23, 1876	24,483,317	56,774,912	63,062,801	1,609,943	8,596,066	100,759,644	84
September 22, 1877	23,739,100	54,002,718	57,906,952	2,130,099	7,702,600	93,385,429	81
September 21, 1878	20,568,200	50,540,681	51,628,029	1,744,534	7,230,252	86,655,670	75
September 13, 1879	19,363,200	52,289,599	61,174,579	1,587,230	7,236,405	86,693,182	73
September 15, 1880	18,788,200	61,795,753	69,179,249	5,231,764	8,058,180	99,850,755	68
September 24, 1881	19,025,700	75,717,130	74,745,135	5,283,929	8,928,175	113,463,572	72

TRUST COMPANIES.

STATEMENT OF THE RESULTS OF THE EXAMINATIONS
OF TRUST COMPANIES, ETC., UNDER CHAPTER 324,
LAWS OF 1874.

BROOKLYN TRUST COMPANY — Brooklyn.

(Examined December 7, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	....	....	.....	.....
United States bonds.....	4	\$100,000	118 $\frac{1}{2}$	\$118,125 00	\$34,250 00
United States bonds, extended 5s.....	3 $\frac{1}{2}$	250,000	102 $\frac{1}{2}$	256,250 00	
Brooklyn City bonds, 1885.....	7	8,000	108 and int.	8,240 00	
Town of Flatbush bonds, 1882 to 1889.....	7	8,000	100 and int.	8,000 00	
Wabash Equipment Co. Trustees' certificates, 1884.....	8	6,000	100	6,000 00	
Wabash Railway Co. bonds, Hannibal & Naples division, 1909.	7	6,000	120	7,200 00	
Indiana, Bloomington and Western bonds, 1900.....	7	2,000	127 $\frac{1}{2}$ and int.	2,550 00	
Ulster and Delaware second mortgage income bonds, 1905.....	7	75,800	20	15,120 00	
Brewers and Maltsters' Insurance Co.'s stock, 15 shares, par \$100.	....	1,500	10	150 00	
Loans secured by collaterals.....	....	....	.....	.....	416,635 00
Bills receivable.....	....	....	.....	.....	8,186,400 00
Cash on hand and in banks.....	....	....	.....	.....	15,000 00
Real estate.....	....	....	.....	.....	104,321 57
Accrued interest.....	....	....	.....	.....	99,000 00
					23,343 93
					\$3,878,950 50
LIABILITIES.					
Capital stock.....	....	....	.....	\$400,00 00	
Due to depositors.....	....	....	.....	3,281,784 99	
Certified checks.....	....	....	.....	8,911 39	
Unpaid dividends.....	....	....	.....	184 00	
Interest and taxes accrued.....	....	....	.....	20,080 00	8,660,910 88
Surplus.....	....	....	.....	.....	\$218,040 12

CENTRAL TRUST COMPANY OF NEW YORK CITY.

(Examined December 12, 1881.)

[Assem. Doc. No. 5.]

ASSETS.	Rate of interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$36,000 00
United States bonds.....	4	\$100,000	118½	\$118,500 00	
United States bonds, extended 08.....	3½	100,000	101½	101,125 00	
United States bonds.....	4½	100,000	114½	114,625 00	
United States bonds, currency 1895.....	6	51,000	130	66,300 00	
United States bonds, currency 1896.....	6	6,000	131	7,860 00	
United States bonds, currency 1897.....	6	250,000	132	330,000 00	
United States bonds, currency 1898.....	6	530,000	133	704,900 00	
United States bonds, currency 1899.....	6	63,000	134	84,420 00	
Bonds of the Pennsylvania company, 1921.....	4½	200,000	102½ and int.	205,000 00	
New York, Lackawanna & Western R. R., 1st mtg. bonds, 1921.	6	100,000	108½	108,750 00	
Eric Railway, consolidated 1st mortgage bonds, 1920.....	7	150,000	129	193,500 00	
Louisville & Nashville Railroad Company, trust certificates.....	6	50,000	100 and int.	50,000 00	
Indiana, Bloom., & Western R'y, first preferred mtg bonds, 1900.	7	50,000	127½ and int.	63,750 00	
Cash on hand and in bank.....	.....	.....	.....	.....	2,148,730 00
Bills purchased.....	.....	.....	.....	.....	71,183 67
Loans secured by collaterals.....	.....	.....	.....	.....	1,245,650 41
Interest accrued.....	.....	.....	.....	.....	7,485,688 33
	.....	.....	.....	.....	98,318 81
	.....	.....	.....	.....	\$11,080,570 72
LIABILITIES.					
Capital stock.....	.....	.....	.....	\$1,000,000 00	
Due to depositors.....	.....	.....	.....	9,216,541 72	
Int., taxes, rent and salaries accrued, and rebate on bills purchased,	.....	.....	.....	144,220 50	
Surplus.....	.....	.....	.....	.....	10,360,762 22
	.....	.....	.....	.....	\$719,808 50

FARMERS' LOAN AND TRUST COMPANY—New York City.

(Examined November 29, 1881.)

114

[ASSEMBLY

ASSETS.	Rate of interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$58,400 00
United States bonds.....	4	\$500,000 00	117½	\$586,250 00	
United States bonds.....	4½	1,300,000 00	114½	1,485,250 00	
Jackson, Lansing and Saginaw R. R. bonds.....	6	200,000 00	109	218,000 00	
Joliet and Northern Indiana R. R. bonds.....	7	8,000 00	100	8,000 00	
Loans on collateral .....	.....	.....	.....	.....	2,297,500 00
Cash .....	.....	.....	.....	.....	10,794,506 73
Accrued interest and commissions.....	.....	.....	.....	.....	245,925 75
					141,261 14
					\$13,537,593 62
LIABILITIES.					
Capital stock.....	.....	\$1,000,000 00			
Due depositors.....	.....	10,764,034 16			
Interest, taxes and expenses accrued.....	.....	163,774 83			
Surplus.....	.....	.....			11,937,808 49
					\$1,600,785 18

MERCANTILE TRUST COMPANY — New York City.

(Examined November 23, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Western Freehold mortgages.....	.....	\$993,893 80	.....	.....	\$1,093,508 63
Other bonds and mortgages. ....	.....	105,614 83	.....	.....	4,259,391 41
Loans secured by collaterals.....	.....	.....	.....	.....	.....
United States bonds.....	4	\$290,850 00	110 $\frac{1}{2}$	\$389,567 38	.....
St. Louis, Iron Mountain and Southern, general consolidated and land grant mortgage bonds.....	5	200,000 00	86	172,000 00	.....
St. Louis, Iron Mountain and Southern, first preferred income bonds.....	.....	147,305 00	100	147,305 00	.....
Iron Mountain Car Trust certificates.....	6	106,000 00	101	107,060 00	.....
Wabash, St. Louis and Pacific general mortgage bonds....	6	365,000 00	97 $\frac{1}{2}$	355,875 00	1,121,807 38
Terre Haute and Logansport Railroad company's stock, 193 shares, par \$50.....	.....	9,650 00	.....	Estimated worth	4,825 00
Portland and Ogdensburgh Railroad bonds, E. D. ....	.....	80,000 00	.....	Estimated worth	32,000 00
Brooklyn City and Newtown R.R. stock, 6395 shares, par \$100	.....	639,500 00	.....	Estimated worth	556,365 00
Cash on hand and deposited in banks.....	.....	.....	.....	.....	494,571 40
Cash with Smith, Paynes & Smith, London.....	.....	.....	.....	.....	99,161 61
Cash with G. E. Gouraud.....	.....	.....	.....	.....	23,652 45
Real estate, at cost.....	.....	.....	.....	.....	921,782 93
Managers and unadjusted accounts.....	.....	.....	.....	.....	18,387 93
Bills receivable.....	.....	.....	.....	.....	80,199 00
Mortgage, interest due and accrued.....	.....	.....	.....	.....	33,551 11
Interest and commissions accrued.....	.....	.....	.....	.....	76,244 74
					\$8,756,448 59

MERCANTILE TRUST COMPANY — New York City. — (Continued.)

LIABILITIES.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Capital stock.....	\$2,000,000 00			
Guaranteed mortgage bonds sold.....	608,100 00			
Debentures sold.....	242,973 66			
Due to depositors.....	5,322,016 91			
Due to sundry individuals.....	38,889 79			
Coupons not presented for payment.....	17,901 90			
Interest, taxes and expenses accrued.....	51,422 97			
Certified checks.....	82,783 51			\$8,868,788 74
Surplus.....	\$392,650 85

NEW YORK LIFE INSURANCE AND TRUST COMPANY.

(Examined November 26, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$1,020,706 69
United States bonds.....	4½	\$1,000,000 00	114½	\$1,142,500 00	
United States bonds.....	4	1,849,000 00	117½	2,167,952 50	
United States bonds, currency 6s, 1895 to 1899.....	6	734,000 00	Var.	970,810 00	
Massachusetts State bonds, 1883 to 1889.....	5	851,000 00	Var.	958,230 00	
New York bonds, 1887 to 1893.....	6	438,700 00	Var.	534,445 00	
Warren R. R. stock, 200 shares, \$50 each.....	.....	10,000 00	110	11,000 00	
Gallatin National Bank stock, 224 shares, \$50 each.....	.....	11,200 00	150	16,800 00	
Bank of America stock, 74 shares, \$100 each.....	.....	7,400 00	152	11,248 00	
Merchants' National Bank stock, 220 shares, \$50 each.....	.....	11,000 00	136	14,960 00	
New Hampshire State bonds, 1892 to 1900.....	6	31,500 00	Var.	36,430 00	
Morris and Essex R. R. second mortgage bonds, 1891.....	7	100,000 00	120	120,000 00	
Central R. R. of New Jersey, first mortgage bonds.....	7	39,000 00	119	46,410 00	
New Jersey State bonds, 1882.....	6	40,000 00	100	40,000 00	
Bills receivable.....	.....	.....	.....	.....	6,070,785 50
Loans on collaterals.....	.....	.....	.....	.....	2,173,625 03
Real estate.....	.....	.....	.....	.....	7,975,009 81
Cash on hand and in bank.....	.....	.....	.....	.....	292,923 08
Suspense account, worth.....	.....	.....	.....	.....	217,570 20
Interest accrued.....	.....	.....	.....	.....	28,760 00
					153,000 00
					\$17,933,280 37

NEW YORK LIFE INSURANCE AND TRUST COMPANY — (Continued).

LIABILITIES.	Rate of interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Capital stock.....	\$1,000,000 00			
Due depositors.....	14,374,076 40			
Annuities granted.....	200,251 41			
Life insurance.....	202,300 00			
Interest and taxes accrued, and rebate on bills receivable.....	401,500 00			\$16,078,027 81
Surplus.....	\$1,855,252 56

REAL ESTATE TRUST COMPANY — New York City.

(Examined December 5, 1931.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	\$39,016 81
Cash on hand, and deposited.....	3,590 08
Stock of real estate trust company, 54½ shares, par \$100.....	\$5,425 00	100	.....	5,425 00
Loans on collaterals.....	19,350 00
Real estate, cost.....	568,782 05	.....	Appraised at	661,775 00
Accrued interest and rents.....	7,400 22
Due from individuals.....	87 05
					\$736,644 16
LIABILITIES.					
Capital stock.....	\$500,000 83	.....	.....
Bonds and mortgages.....	0,000 00	.....	.....
Bonds of the company.....	18,000 00	.....	.....
Due to depositors.....	154,226 70	.....	.....
Due to individuals.....	16,282 53	.....	.....
Interest, taxes, and expenses accrued.....	8,136 78	.....	.....	697,646 84
Surplus.....	\$38,997 32

TRUST AND DEPOSIT COMPANY OF ONONDAGA — Syracuse.

(Examined October 19, 1881.)

120

[ASSEMBLY

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$90,270 00
United States bonds, extended 6s.....	3½	\$50,000 00	100½	\$50,375 00	
United States bonds, 1891.....	4½	50,000 00	113	56,500 00	
Syracuse Northern R. R. bonds, 1901.....	7	10,000 00	110	11,000 00	
Oswego and Syracuse R. R. bonds, 1885.....	7	8,000 00	105	8,150 00	
Gas-Light Company of Syracuse bonds, 1893.....	8	2,000 00	110	2,200 00	
Syracuse City Water-Works Co.'s bonds, 1882.....	7	1,000 00	103	1,030 00	
St. Louis, Iron Mountain and Southern general consolidated railway and land grant mortgage bonds.....	5	10,000 00	88	8,800 00	
New York, Lake Erie and Western new consolidated second mortgage bonds..	6	120,000 00	102½	123,300 00	
Cash on hand and deposited.....	.....	.....	.....	.....	256,355 00
Call loan and time loans.....	.....	.....	.....	.....	479,367 55
Furniture, fixtures and safes.....	.....	.....	.....	.....	287,312 08
Accrued interest.....	.....	.....	.....	.....	8,500 00
					11,871 81
					\$1,128,676 44
LIABILITIES.					
Capital stock.....	.....	\$100,000 00	.....	.....
Due depositors.....	.....	990,151 08	.....	.....
Accrued interest, taxes, rents, and salaries.....	.....	10,753 04	.....	.....	1,100,004 12
Surplus.....	.....	.....	.....	.....	\$27,772 82

UNION TRUST COMPANY—New York City.
(Examined December 9, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
United States bonds.....	4	\$600,000 00	118½	\$708,750 00	
United States bonds.....	4½	100,000 00	114½	114,875 00	
United States bonds, currency 1899.....	6	119,000 00	138	158,270 00	
United States bonds, currency 1899.....	6	131,000 00	134	175,540 00	
United States bonds, extended 6s.....	3½	142,000 00	100½	143,065 00	
United States bonds, extended 5s.....	3½	808,000 00	102½	828,200 00	
Lake Shore and Michigan Southern Railway companies consolidated mortgage and sinking fund bonds.....	7	100,000 00	129	129,000 00	\$2,257,200 00
Bonds and mortgages.....					14,600 00
Real estate.....					2,000 00
Cash on hand and in bank.....					483,317 61
Loans secured by collaterals.....					13,397,491 86
Interest and commissions accrued.....					168,927 15
					\$16,323,536 62
LIABILITIES.					
Capital stock paid in.....				\$1,000,000 00	
Due to depositors.....				14,087,337 09	
Certified checks outstanding.....				60,935 21	
Unpaid dividend and coupon checks outstanding.....				16,861 68	
Expenses, taxes and interest accrued.....				180,886 26	15,346,020 24
Surplus.....					\$977,516 38

[Assem. Doc. No. 5.]

16

TRUST AND DEPOSIT COMPANY OF ONONDAGA — Syracuse.

(Examined October 19, 1881.)

120

[ASSEMBLY

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.	.....	.....	.....	.....	\$90,270 00
United States bonds, extended 6s.	3½	\$50,000 00	100½	\$50,375 00	
United States bonds, 1801.	4½	50,000 00	113	56,500 00	
Syracuse Northern R. R. bonds, 1901.	7	10,000 00	110	11,000 00	
Oswego and Syracuse R. R. bonds, 1885.	7	8,000 00	105	8,450 00	
Gas-light Company of Syracuse bonds, 1893.	8	2,000 00	110	2,200 00	
Syracuse City Water-Works Co.'s bonds, 1882.	7	1,000 00	103	1,030 00	
St. Louis, Iron Mountain and Southern general consolidated railway and land grant mortgage bonds.	5	10,000 00	88	8,880 00	
New York, Lake Erie and Western new consolidated second mortgage bonds.	6	120,000 00	102½	123,300 00	
Cash on hand and deposited. ....	.....	.....	.....	.....	250,355 00
Call loan and time loans. ....	.....	.....	.....	.....	479,367 55
Furniture, fixtures and safes. ....	.....	.....	.....	.....	287,312 08
Accrued interest. ....	.....	.....	.....	.....	8,500 00
					11,871 81
					\$1,128,673 44
LIABILITIES.					
Capital stock. ....	.....	\$100,000 00	.....	.....
Due depositors. ....	.....	990,151 08	.....	.....
Accrued interest, taxes, rents, and salaries. ....	.....	10,753 04	.....	.....	1,100,904 12
Surplus. ....	.....	.....	.....	.....	\$27,772 82

UNION TRUST COMPANY—New York City.
(Examined December 9, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
United States bonds.....	4	\$600,000 00	118½	\$708,750 00	
United States bonds.....	4½	100,000 00	114½	114,375 00	
United States bonds, currency 1898.....	6	119,000 00	133	158,270 00	
United States bonds, currency 1899.....	6	131,000 00	134	175,540 00	
United States bonds, extended 6s.....	3½	142,000 00	100½	143,065 00	
United States bonds, extended 5s.....	3½	808,000 00	102½	828,200 00	
Lake Shore and Michigan Southern Railway companies consolidated mortgage and sinking fund bonds.....	7	100,000 00	129	129,000 00	\$2,237,200 00
Bonds and mortgages.....					14,600 00
Real estate.....					2,000 00
Cash on hand and in bank.....					483,317 61
Loans secured by collaterals.....					18,397,491 86
Interest and commissions accrued.....					168,927 15
					\$16,323,536 63
LIABILITIES.					
Capital stock paid in.....				\$1,000,000 00	
Due to depositors.....				14,087,337 09	
Certified checks outstanding.....				60,935 21	
Unpaid dividend and coupon checks outstanding.....				16,861 68	
Expenses, taxes and interest accrued.....				180,886 26	15,346,020 24
Surplus.....					\$977,516 38

[Assem. Doc. No. 5.]

16

TRUST AND DEPOSIT COMPANY OF ONONDAGA — Syracuse.

(Examined October 19, 1881.)

120

[ASSEMBLY

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$90,270 00
United States bonds, extended 6s.....	3½	\$50,000 00	100½	\$50,375 00	
United States bonds, 1891.....	4½	50,000 00	113	56,500 00	
Syracuse Northern R. R. bonds, 1901.....	7	10,000 00	110	11,000 00	
Oswego and Syracuse R. R. bonds, 1885.....	7	8,000 00	105	8,450 00	
Gas-Light Company of Syracuse bonds, 1893.....	8	2,000 00	110	2,200 00	
Syracuse City Water-Works Co.'s bonds, 1882.....	7	1,000 00	103	1,030 00	
St. Louis, Iron Mountain and Southern general consolidated railway and land grant mortgage bonds.....	5	10,000 00	88	8,800 00	
New York, Lake Erie and Western new consolidated second mortgage bonds.....	6	120,000 00	102½	123,300 00	
Cash on hand and deposited.....	.....	.....	.....	.....	250,355 00
Call loan and time loans.....	.....	.....	.....	.....	479,367 55
Furniture, fixtures and safes.....	.....	.....	.....	.....	287,312 08
Accrued interest.....	.....	.....	.....	.....	8,500 00
					11,871 81
					\$1,128,678 44
LIABILITIES.					
Capital stock.....	.....	\$100,000 00	.....	.....
Due depositors.....	.....	990,151 08	.....	.....
Accrued interest, taxes, rents, and salaries.....	.....	10,753 04	.....	.....	1,100,904 13
Surplus.....	.....	.....	.....	.....	\$27,772 82

UNION TRUST COMPANY—New York City.
(Examined December 9, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
United States bonds.....	4	\$600,000 00	118½	\$708,750 00	
United States bonds	4½	100,000 00	114½	114,375 00	
United States bonds, currency 1898.....	6	119,000 00	138	158,270 00	
United States bonds, currency 1899.....	6	131,000 00	134	175,540 00	
United States bonds, extended 6s.....	3½	142,000 00	100½	143,065 00	
United States bonds, extended 5s.....	3½	808,000 00	102½	828,200 00	
Lake Shore and Michigan Southern Railway companies consolidated mortgage and sinking fund bonds.....	7	100,000 00	129	129,000 00	\$2,237,200 00
Bonds and mortgages.....					14,600 00
Real estate.....					2,000 00
Cash on hand and in bank.....					488,317 61
Loans secured by collaterals.....					18,397,491 86
Interest and commissions accrued.....					168,927 15
					\$16,323,536 62
LIABILITIES.					
Capital stock paid in.....				\$1,000,000 00	
Due to depositors.....				14,087,337 09	
Certified checks outstanding.....				60,935 21	
Unpaid dividend and coupon checks outstanding.....				16,861 68	
Expenses, taxes and interest accrued.....				180,886 26	15,346,020 24
Surplus.....					\$977,516 98

[Assem. Doc. No. 5.]

UNITED STATES TRUST COMPANY—New York City.

(Examined December 1, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Bonds and mortgages.....	.....	.....	.....	.....	\$2,406,500 00
United States bonds, extended 6s.....	3½	\$100,000 00	102	\$102,000 00	
United States bonds.....	4½	1,380,000 00	114½	1,580,100 00	
United States bonds.....	4	520,000 00	117½	612,300 00	
Bond of corporation of Trinity Church, 1882.....	5	110,000 00	100	110,000 00	
Loans on collaterals.....	.....	.....	.....	.....	2,404,400 00
Bills purchased.....	.....	.....	.....	.....	20,074,532 96
Cash.....	.....	.....	.....	.....	1,749,609 66
Banking-house.....	.....	.....	.....	.....	445,694 28
Other real estate.....	.....	170,000 00	.....	.....
.....	.....	54,329 00	.....	.....
Interest accrued.....	.....	.....	.....	.....	224,329 60
.....	.....	.....	.....	.....	298,632 75
.....	.....	.....	.....	.....	\$33,598,099 25
LIABILITIES.					
Capital stock.....	.....	\$2,000,000 00	.....	.....
Due depositors.....	.....	27,093,529 27	.....	.....
Interest and taxes accrued and rebate on bill purchased.....	.....	654,100 54	.....	.....
Surplus.....	.....	.....	.....	.....	29,747,629 81
.....	.....	.....	.....	.....	\$8,851,069 44

MORTGAGE COMPANIES.
EQUITABLE TRUST COMPANY OF NEW LONDON, CONN. — New York City.
 (Examined December 8, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Mortgage loans.....	\$3,354,238 63			\$5,004,631 55
Special mortgage loans.....	50,645 00			2,652,111 02
Mortgage notes.....	32,556 76			235,441 75
May, 1878, loans.....	16,018 68			18,059 96
May, 1879, loans.....	98,903 87			2,145 50
November, 1879, loans.....	232,165 28			
May, 1880, loans.....	288,862 96			
November, 1880, loans.....	341,503 23			
February, 1881, loans.....	190,914 66			
May, 1881, loans.....	41,496 91			
August, 1881, loans.....	58,638 79			
November, 1881, loans.....	299,686 78			
Real estate.....	
Interest due from borrowers.....	
Insurance and taxes advanced.....	
Bills receivable.....	
Cash on hand, and with trust companies, banks and bankers and in hands of trustees.....	
Due from sundry debtors.....	
					\$81,410 37
					10,481 17
					\$8,304,281 32

LIABILITIES.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Capital stock paid in.....	\$1,500,000 00	
Guaranteed mortgage bonds sold.....	2,260,350 00	
Trustees' certificates, May, 1892.....	11,000 00	
Debentures, May, 1889.....	1,150,000 00	
Debentures, November, 1889.....	950,000 00	
Debentures, May, 1890.....	850,000 00	
Debentures, November, 1890.....	724,000 00	
Debentures, February, 1891.....	448,000 00	
Guaranteed mortgage bonds due and outstanding.....	37,500 00	
Coupons not presented.....	53,746 00	
Due to sundry creditors.....	16,321 33	
Loans from individuals and firms.....	148,360 00	
Surplus.....	\$8,149,277 33
					\$155,003 99

UNITED STATES MORTGAGE COMPANY—New York City.

(Examined December 1, 1881.)

ASSETS.	Rate of Interest.	Amount at par.	MARKET VALUE.		Totals.
			Rate.	Amount.	
Mortgage loans.....	\$3,188,070 85
Taxes, etc., advanced by company.....	\$157,524 66	.....	.....
Interest due and accrued.....	378,947 12	.....	.....
Real estate acquired by foreclosure, cost.....	587,471 78
Furniture in Sherman House, Chicago, cost.....	849,915 40
Real estate, 50 Wall street, New York, cost.....	\$555,765 01	.....	.....	66,115 83
Less mortgage on same.....	300,000 00	.....	.....
Rents accrued.....	255,765 01
Cash on hand and deposited, with accrued interest.....	5,100 83
					727,250 74
					\$5,629,690 43
LIABILITIES.					
Capital stock.....	\$1,000,000 00	.....	.....
Bonds of the company due 1912 — £925,400 at \$4.84.....	4,478,936 00	.....	.....
Accrued interest on same, £27,762.....	134,368 08	.....	.....
Unearned interest collected in advance.....	4,215 00	.....	.....
					5,617,519 08
Surplus.....	\$12,171 35

INDEX.

A.	PAGE.	H.	PAGE.
Albany County Bank	34	Henry D. Barto & Co.'s Bank.	62
America, Bank of	45	Hornellsville, Bank of.....	63
Atlantic State Bank.....	36	Howell M. Reeve, banker	64
Attica, Bank of.....	37		
		I.	
B.		Island City Bank.	65
Baldwin's Bank of Penn Yan	38		
Baldwinsville State Bank	39	J.	
Batavia, Bank of.....	40	Johnstown Bank.	66
Brooklyn Bank.....	41		
Buffalo, Bank of	42	L.	
Banks doing business.....	18	Long Island Bank	67
Banks, general statement of those in the city of New York.....	107		
Banks, general statement of all.....	106	M.	
Banks, general statement of those out- side of the city of New York	108	Manhattan Company.....	68
Brooklyn Trust Company, examination of	112	Manufacturers' Bank, Cohoes.....	69
		Manufacturers and Traders' Bank.....	70
C.		Marine Bank, Buffalo.....	71
Cataract Bank.	43	Mechanics' Bank, Brooklyn	72
Central Bank of Westchester County....	44	Mechanics and Farmers' Bank....	73
Central Trust Company, examination of,	113	Mechanics and Traders' Bank.....	74
Citizens' Bank, Waverly.....	45	Mercantile Trust Company, examination of	115
City Bank of Rochester	46	Merchants' of Buffalo	75
City Bank of Schenectady.....	47	Merchants' Bank, Watertown.....	76
Commerce, Bank of, Buffalo	48	Metropolis, Bank of the.....	77
Commercial Bank, Brooklyn.....	49	Monroe, Bank of	78
Corn Exchange Bank	50	Mount Morris Bank.....	79
		Murray Hill Bank	80
E.			
Eleventh Ward Bank	51	N.	
Equitable Trust Company, examination of	123	Nassau Bank.....	81
		New York Life Insurance and Trust Company, examination of.....	117
F.		New York State Banking Company....	82
Farmers' Bank, Fayetteville	52	North America, Bank of	83
Farmers' Loan and Trust Company, ex- amination of	114	North River Bank.....	84
Fifth Avenue Bank	53		
Flushing and Queens County Bank	54	O.	
Fulton Bank.....	55	Ogdensburg Bank.....	85
		Oneida County Bank	86
G.		Oriental Bank.....	87
German American Bank.....	56		
German Bank, Buffalo.....	57	P.	
German Exchange Bank	58	Pacific Bank.....	88
Germania Bank	59	People's Bank	89
Gouverneur, Bank of.....	60	Phoenix Bank	90
Greenwich Bank	61	Produce Bank	91
		R.	
		Real Estate Trust Company, examina- tion of	119

	PAGE.	Tables—Continued.	PAGE.
Robert Gere Bank	92	Closing banks that do not report, and have not taken measures to close their circulation account.....	23
Rochester, Bank of.....	93	Comparative statement of capital, deposits, etc., since 1865....	109
S.		Detailed statement of condition of banks, together with general state- ment.....	34 to 103
Saratoga County Bank.....	94	Expenses on account of banks and trust companies.....	31
Schenectady Bank.....	95	Incorporated banks that have not advertised the redemption of their notes.....	24
Skaneateles, Bank of.....	96	Notes destroyed during the year....	8
State Bank, Chatham.....	97	Showing aggregate of securities and total circulation.....	16
State Bank of Fort Edward.....	98	Trust and Deposit Company of Onon- daga, Syracuse, examination of.....	120
State Bank of Randolph.....	99		
State Bank of Syracuse.....	100		
St. Lawrence County Bank.....	101		
Susquehanna Valley Bank.....	102		
T.			
Tables:			
Banks whose notes were advertised subsequent to 1859, time for re- demption having expired	25		
Banks doing business	18		
Banks whose time for redeeming their notes expired prior to Oct. 1, 1881, and at that date had balances of cash or stocks to their credit on the books of the department	24		
Banks having circulation, with names of redeeming agents	25		
Closing banks that have made final deposit of cash.....	22		
Closing banks that have made final deposits of stocks.....	21		
		U.	
		Union Bank of Medina.....	103
		Union Trust Company, examination of..	121
		United States Mortgage Company, exam- ination of.....	135
		United States Trust Company, examina- tion of	122
		W.	
		West Side Bank.....	104
		White's Bank of Buffalo.....	105

STATE OF NEW YORK.

No. 6.

IN ASSEMBLY,

JANUARY 3, 1882.

RULES AND ORDERS

OF THE ASSEMBLY OF THE STATE OF NEW YORK.

ADOPTED BY THE ASSEMBLY JANUARY 4, 1881, AND REFERRED TO
COMMITTEE ON RULES.

CHAPTER I.

OF THE POWERS AND DUTIES OF THE SPEAKER.

RULE 1. The speaker shall take the chair each day at the hour to which the house shall have adjourned. He shall call to order, and, except in the absence of a quorum, shall proceed to business in the manner prescribed by these rules.

RULE 2. He shall possess the powers and perform the duties herein prescribed, viz.:

1. He shall preserve order and decorum.
2. He shall decide all questions of order, subject to appeal to the house. On every appeal he shall have the right, in his place, to assign his reason for his decision.
3. He shall appoint all committees, except where the house shall otherwise order.
4. He may substitute any member to perform the duties of the chair for a period not exceeding two consecutive legislative days, but for no longer period, except by special consent of the house.
5. When the house shall be ready to go into committee of the whole, he shall name a chairman to preside therein.
6. He shall certify the passage of all bills by the house, with the date thereof, together with the fact whether passed as a majority, three-fifths or two-thirds bills, as required either by the constitution or laws of this State.

7. He shall designate the persons who shall act as reporters for the public press, not exceeding twenty-three in number; but no reporter shall be admitted to the floor who is not an authorized representative of a daily paper. Such reporters, so appointed, shall be entitled to such seats as the speaker shall designate, and shall have the right to pass to and from such seats in entering and leaving the assembly chamber.

8. In case of any disturbance or disorderly conduct in the galleries or lobby, the speaker shall have power to order the same to be cleared.

CHAPTER II.

OF THE ORDER OF BUSINESS.

RULE 3. The first business of each day's session shall be the reading of the journal of the preceding day, and the correction of any errors that may be found to exist therein. After which, except on days and at times set apart for the consideration of general or special orders, the order of business, which shall not be departed from, except by unanimous consent of the house, shall be as follows, viz.:

1. Introduction of bills by counties, in alphabetical order.
2. Reports of standing committees in the order in which the committees are stated in rule fourteen.
3. Presentation of petitions by counties, in alphabetical order.
4. Motions and resolutions, to be called for by counties in reverse order.
5. Reports of select committees.
6. Third reading of bills.
7. The preferred calendar of general orders.
8. Unfinished business of the general orders.
9. Special orders of the day.
10. General orders.

Messages from the governor and from the senate, communications from State officers, and reports from the committees on engrossed bills, public printing and sub-committee of the whole, may be received under any order of business.

CHAPTER III.

OF THE RIGHTS AND DUTIES OF MEMBERS.

RULE 4. Petitions, memorials, and any other papers addressed to the house, shall be presented by the speaker, or by any member in his place.

RULE 5. Every member presenting a paper shall indorse the same; if a petition, memorial, or report to the legislature, with a brief statement of its subject or contents, adding his name; if a notice or resolution, with his name; if a report of a committee, a statement of such report, with the name of the committee and members making the same; if a bill, a statement of its title, with his name.

RULE 6. Every member who shall be within the bar of the house when a question is stated from the chair, shall vote thereon, unless he be excused by the house, or unless he be directly interested in the

question; but no member shall be obliged to vote on any question unless within the bar when his name is called. The bar of the house shall be deemed to include the body of the assembly chamber.

CHAPTER IV.

OF ORDER AND DECORUM.

RULE 7. No member rising to debate, to give a notice, make a motion or report, or to present a petition or other paper, shall proceed until he shall have addressed the speaker, and have been recognized by him.

RULE 8. While a member is speaking, no member shall entertain any private discourse or pass between him and the chair.

RULE 9. While the speaker is putting a question, or a count is being had, no member shall speak or leave his place.

RULE 10. When a motion to adjourn is carried, the members and officers shall keep their seats and places until the speaker declares the house adjourned.

CHAPTER V.

OF ORDER IN DEBATE.

RULE 11. No member shall speak more than once to the same general question, without leave of the house, until every member desiring to speak on the question pending shall have spoken.

RULE 12. If any member, in speaking, transgress the rules of the house, the speaker, or any member, may call to order, in which case the member so called to order shall immediately sit down, and shall not rise unless to explain or proceed in order.

RULE 13. All questions relating to the priority of business, that is, the priority of one question or subject-matter over another, under the same order of business, shall be decided without debate.

CHAPTER VI.

ON COMMITTEES AND THEIR DUTIES.

RULE 14. The standing committees shall be as follows, viz.:

To consist each, of eleven members:

1. Ways and means.
2. Judiciary.
3. General laws.
4. Canals.
5. Affairs of cities.
6. Railroads.
7. Commerce and navigation.
8. Insurance.
9. Banks.
10. Internal affairs.
11. Affairs of villages.
12. Roads and bridges.
13. Public printing.

14. Public health.
15. Charitable and religious societies.
16. Public education.
17. Militia.
18. Claims.
19. Federal relations.

To consist each, of nine members :

20. Game laws.
21. State prisons.
22. State charitable institutions.
23. Privileges and elections.
24. Civil divisions.
25. Trade and manufactures.
26. Manufacture of salt.
27. Public lands.
28. Agriculture.
29. Indian affairs.
30. Petition of aliens.
31. Two-thirds and three-fifths bills.
32. Engrossed bills.
33. Grievances.
34. Expenditures of the house.
35. Expenditures of the executive department.

To consist each, of five members :

36. Rules.
37. Joint library.
38. There shall be also, a committee on "general orders," to be called the "sub-committee of the whole," to consist of sixteen members, viz. : two from each judicial district of the State ; whose duties are defined in rule 40.

RULE 15. It shall be the duty of each of the several committees to consider and report without unnecessary delay, upon the respective bills and other matters referred to it by the house ; and also to inquire into the matters indicated by its name, and to report thereon to the house any information, and any bill or resolution which it may deem conducive to the public interest.

RULE 16. It shall be the duty of the committee on ways and means to examine into all the departments of the government, whether executive, legislative, judicial or otherwise, where salaries or emoluments are given ; to examine, ascertain, and report to the house what officers can be dispensed with, and what salaries or emoluments can be reduced, and how far consistent with the public good, and to take such action in regard to section eight of article seven of the constitution of this State as may be requisite.

RULE 17. It shall be the duty of the committee on two-thirds and three-fifths bills to carefully examine all bills coming within the ninth section of the first article, and the twenty-first section of article three of the constitution of this State ; and when any bill shall have passed in committee of the whole house, on which the speaker may entertain doubts whether it comes within the provisions of either of the said sections, it shall be referred to the said committee to examine and report thereon, before the question on the final passage shall be taken.

RULE 18. It shall be the duty of the committee on general laws to consider and report upon all bills and other matters which shall be referred to them. And they shall have authority to report such original general laws and such amendments to existing general laws as they shall deem in accordance with the requirements of the constitution. Every bill of a general character reported by them shall be placed on a preferred calendar of the general orders, which shall have precedence of the unfinished business of the general orders.

RULE 19. The committee on engrossed bills shall carefully examine, in the order in which they shall be directed by the house to be engrossed for a third reading, all bills so engrossed, and see that the same are correctly engrossed, and they shall immediately report the same in like order to the house before they are read the third time.

RULE 20. It shall be the duty of the committee on public printing to examine and report on all questions of printing referred to them; to examine, from time to time, and ascertain whether the prices charged for printing are in conformity to the contract therefor, and whether it is done in conformity to the orders of the house and without unreasonable delay; to ascertain and report what number of copies ought usually to be printed, and how distributed; and to report to the house, from time to time, any measures they may deem useful for the economical and proper management of the public printing.

RULE 21. It shall be the duty of the committee on expenditures of the house, and in the executive department, severally to inquire into the said expenditures, and whether the same have been made in conformity to law, and whether proper vouchers exist for the same, and whether the funds provided for the purpose are economically applied, and to report, from time to time, such provisions, laws and regulations as may conduce to economy, and to secure the faithful disbursement of the moneys appropriated by law.

RULE 22. All petitions, memorials and bills relating to claims upon the State, shall be referred to the standing committee upon claims for examination and report; but such committee shall not report a bill in any case where provision is made by law for the determination of the claim by any officer, board or tribunal, established for that purpose; but in cases where no such provision shall exist, they may report by bill providing for its audit and determination by the appropriate department or tribunal. No papers on the files of the house, which have been reported upon adversely by a committee on claims, shall be taken therefrom for a rehearing, unless the claimant shall present a petition, verified by his oath, showing that an error was committed in the former report, and that relief in the case may be obtained only through the action of the legislature.

RULE 23. It shall be the duty of the committee on game laws to consider all petitions, bills and other matters referred to them relating to the protection and preservation of game and fish, and to report thereon such measures as they shall deem conducive to the public interest.

CHAPTER VII.

OF THE GENERAL ORDERS AND SPECIAL ORDERS.

RULE 24. The matters referred to the committee of the whole house shall constitute the general orders, and their titles shall be recorded in

a calendar kept for that purpose by the clerk, in the order in which they shall be referred severally.

RULE 25. The business of the general orders shall be taken up in the following manner, viz.: The clerk shall announce the title of each bill or other matter, as it shall be reached in its order; whereupon it shall be taken up on the call of any member, without the putting of a question therefor; but if not so moved, it shall lose its precedence for the day. And whenever three bills have been thus moved the house shall go into committee of the whole upon them without further order. But no bill or other matter shall be taken out of its order, except by vote of two-thirds of the members present, nor shall any unprinted bill be taken up unless by order of the house, on one day's notice thereof.

RULE 26. Tuesday and Thursday of each week shall be set apart especially for the consideration of the general orders; but they may be considered on any other day when reached in their order.

RULE 27. Each member shall be furnished daily with a printed list of the general orders, which shall be kept on his files by the sergeant-at-arms, in the same manner as other printed documents.

RULE 28. Any matter may be made a special order for any particular day, by the assent of two-thirds of the members present. But it shall not be in order to make any matter a special order from day to day; and no more than three bills or other matters shall be made the special order for the same day. No special order shall be postponed or rescinded, except by a vote of two-thirds of the members present.

CHAPTER VIII.

OF THE COMMITTEE OF THE WHOLE.

RULE 29. The same rules shall be observed in committee of the whole as in the house, so far as the same are applicable, except that the previous question shall not apply; nor the yeas and nays be taken.

RULE 30. A motion to rise and report progress shall be in order at any stage, and shall be decided without debate.

RULE 31. Bills and other matters shall be considered in committee of the whole in the following manner, viz.: They shall be first read through, if the committee so direct; otherwise they shall be read and considered by sections, leaving the title to be last considered. All amendments, in their proper connection, shall be reported to the house by the chairman.

RULE 32. If at any time when in committee of the whole house, it be ascertained that there is no quorum, the chairman shall immediately report the fact to the speaker.

CHAPTER IX.

OF BILLS.

RULE 33. No bill shall be introduced in the house, except in one of the following modes, viz.:

1. Under the order of introduction of bills by counties in alphabetical order.

2. By unanimous consent of the house.

3. By report of a committee.

4. By order of the house.

5. By message from the senate.

RULE 34. No private bill shall be introduced, but upon a memorial or petition presented to the house and signed by the party or parties praying for the passage of the same, except by order of the house.

RULE 35. The title of all bills introduced shall state concisely the subject-matter of such bills.

RULE 36. Every message from the senate, communicating any bill for the concurrence of the house, shall, with the accompanying documents, if any, be referred to a standing or select committee to consider and report thereon, and every such message, communicating an amendment, shall be submitted to the house for its concurrence, unless otherwise ordered.

RULE 37. All bills, whether introduced in the house or communicated by message from the senate, shall, after their second reading, be referred to a standing or select committee, to consider, and report thereon. Such committee may report any bill, either with or without amendments, or they may report against the same. All bills favorably reported shall, if the report be agreed to, be committed to the committee of the whole; but where a bill has been reported adversely, and such report shall be agreed to by the house, it shall not go upon the general orders, but shall be considered as rejected.

RULE 38. Bills reported by the committee of the whole shall be subject to debate before the question to agree with the committee in their report is put; but such amendments only shall be in order as were offered in committee of the whole. And where a bill shall be reported by the committee of the whole, with the enacting clause stricken out, and the report shall be agreed to by the house, or a report favorable to the passage of a bill shall be disagreed to by a vote of the house, such bill shall be considered as rejected.

RULE 39. Every bill shall receive three separate readings, previous to its final passage, and the third reading shall be on a day subsequent to that on which the bill passed in committee of the whole, unless the house, by a vote of two-thirds of the members present, shall direct otherwise.

RULE 40. Any bill printed and upon the general orders, and which has been reported favorably by a standing committee, may be referred to the sub-committee of the whole by resolution in writing, reciting its number and its title in full, except it be

1. One that makes an appropriation from, or may create any charge upon, the State treasury.
2. Which authorizes or imposes any State tax, or which exempts or releases any property from taxation.
3. Which grants or amends any franchise to any individual or individuals, corporation or corporations.
4. Which releases or conveys the interest of the State in any property.
5. Which amends or repeals the charter of any savings bank or insurance company.
6. Which alters, amends or repeals any of the general statutes for the formation of any corporation.
7. Which alters, amends or repeals the charter of any railroad, plank-road or turnpike company, or of any private corporation, or which removes any restriction from any such company or increases the fare or compensation for traveling on the road or roads of any such company.

8. Which alters or amends the charters of any of the cities of the State.

Bills in such committees shall be considered in the same manner as in committee of the whole house, except that the ayes and nays shall be taken on the question of reporting any bill, and that the assent of a majority of all the members of the committee shall be required to a favorable report.

Any bill so reported favorably by said committee may again be referred to the committee of the whole for consideration, upon the demand of thirty-five members of the house, made at any time before the third reading of such bill is completed.

The clerk of the house shall act as the clerk of such committee, and keep a journal of its proceedings, and he shall submit with each report of the committee, a record of the action of the committee upon it; which report and record shall be printed and lie on the table one day before consideration by the house.

RULE 41. No bill except such as shall be reported by the sub-committee of the whole in accordance with rule 40, shall be ordered to a third reading until it shall have been considered in committee of the whole; nor shall it be in order to refer any bill to a standing committee to report complete unless by the vote of two-thirds of the members present.

RULE 42. No bill originating in the assembly shall be put upon its third reading until it shall have been reported by the committee on engrossed bills as correctly engrossed, unless by unanimous consent. Nor shall any bill be read the last time, unless it shall have been once printed, without the consent of two-thirds of the members present.

RULE 43. The third reading of bills shall take place in the order in which they have been ordered to a third reading, unless the house, by a vote of two-thirds of the members present, direct otherwise, or the bill to be read is laid on the table. And the question on the final passage of every bill shall be taken immediately after such third reading, and without debate.

RULE 44. The same vote that would be required to pass any bill shall be requisite to carry a reconsideration thereof. But the final vote upon the passage of any bill creating, continuing or renewing any incorporation otherwise than municipal, shall not be reconsidered whenever such bill shall be rejected on its last reading.

RULE 45. A register shall be kept by the clerk of all bills introduced in the house, or transmitted for concurrence from the senate, in which shall be recorded, under appropriate heads, the progress of such bills, from the date of their introduction to the time of their transmission; if assembly bills, to the governor, or, if senate bills, their return to the senate.

CHAPTER X.

ON MOTIONS AND THEIR PRECEDENCE.

RULE 46. When a question shall be under consideration, no motion shall be received except as herein specified, which motions shall have precedence in the order stated, viz.:

1. For an adjournment of the house.

2. A call of the house.
3. For the previous question.
4. To lay on the table.
5. To postpone indefinitely.
6. To postpone to a certain day.
7. To go into committee of the whole on the pending subject immediately.
8. To commit to a committee of the whole.
9. To commit to a standing committee.
10. To commit to a select committee.
11. To amend.

RULE 47. The motion to adjourn for the day and to lay on the table shall be decided without amendment or debate. The several motions to postpone or commit shall preclude all debate of the main question.

RULE 48. Every motion or resolution shall be first stated by the speaker, or read by the clerk, before debate and immediately before putting the question. And every motion except those specified in subdivisions one to ten, inclusive, of the forty-sixth rule, shall be reduced to writing, if the speaker or any member desire it.

RULE 49. After a motion shall be stated by the speaker, it shall be deemed in the possession of the house, but may be withdrawn at any time before it shall be decided or amended.

RULE 50. The motion to adjourn, to take a recess, and to adjourn for a longer period than one day, shall always be in order; but the latter motion shall not preclude debate.

RULE 51. A motion to reconsider any vote must be made on the same day on which the vote proposed to be reconsidered was taken, or on the legislative day next succeeding, and, except in the case of a vote on the final passage of a bill, by a member who voted in the majority. Such motion may be made under any order of business, but shall be considered only under the order of business in which the vote proposed to be reconsidered occurred. The motion to reconsider the vote on the final passage of any bill, shall be privileged to any member.

A motion to recall a bill from the governor for correction may be made under any order of business, and the votes for reconsideration, amendment and final passage of such bill may be taken immediately upon its return.

A motion for reconsideration being put and lost, shall not be renewed, nor shall any vote be a second time reconsidered, without unanimous consent.

CHAPTER XI.

OF RESOLUTIONS.

RULE 52. The following classes of resolutions shall lie over one day for consideration, after which they may be called up, as of course, under their appropriate order of business.

1. All concurrent resolutions.
2. Resolutions containing calls for information on the executive department.
3. Resolutions giving rise to debate, except such as relate to the dis-

position of matters immediately before the house, such as relate to the business of the day on which they are offered, and such as relate to adjournment or taking a recess for a day.

RULE 53. All resolutions for printing extra copies of documents shall be referred to the committee on printing, who shall report on each resolution within seven days after such reference.

RULE 54. All other resolutions calling for or leading to expenditures for the uses of the legislature, shall be referred to, and reported on, by the committee on the expenditures of the house, unless the house shall designate some other committee.

CHAPTER XII.

OF THE PREVIOUS QUESTION.

RULE 55. The "previous question" shall be as follows: "*Shall the main question be now put?*" and, until it is decided, shall preclude all amendments or debate. When, on taking the previous question, the house shall decide that the main question shall not now be put, the main question shall be considered as still remaining under debate. The "main question" shall be on the passage of the bill, resolution or other matter under consideration; but when amendments are pending, the question shall first be taken upon such amendments in their order; and when amendments have been adopted in committee of the whole, and not acted on in the house, the question shall be taken upon such amendments in like order, and, if the previous question has been ordered, without further debate or amendment.

CHAPTER XIII.

OF THE ASSEMBLY CHAMBER AND THE PRIVILEGES OF ADMISSION TO THE FLOOR THEREOF.

RULE 56. The use of the assembly chamber may be granted to the State agricultural society, the State medical society, and such other societies as are required by law to report to the legislature. No application for the use of the chamber for any other purpose shall be entertained without the unanimous consent of the house.

RULE 57. The following classes of persons shall be entitled to admission to the floor of the house during the session thereof, viz.:

1. The governor and lieutenant-governor.
2. The members of the senate.
3. The State officers and their deputies.
4. The regents of the university.
5. The capitol commissioners.
6. Persons in the exercise of an official duty directly connected with the business of the house.
7. The reporters for the press as provided by subdivision seven of rule two. *See subdivision 7 of rule 2.*
8. Ex-speakers of the assembly.

No other person shall be admitted to the floor during the session, except upon the permission of the speaker; and persons so admitted shall be allowed to occupy places only in the seats in the rear of the assembly chamber. All permits granted by the speaker may be revoked by him at pleasure, or upon the order of the house.

CHAPTER XIV.

MISCELLANEOUS PROVISIONS.

RULE 58. In all cases of the absence of a quorum during the session of the house, the members present may take such measures as they shall deem necessary to secure the presence of a quorum; and may inflict such censure or pecuniary penalty as they may deem just, on those who, on being called on for that purpose, shall render no sufficient excuse for their absence.

RULE 59. When the house shall be equally divided on any question, including the speaker's vote, the question shall be deemed to be lost.

RULE 60. If any question contains several distinct propositions, it shall be divided by the chair at the request of any member, but a motion to strike out and insert shall be indivisible.

RULE 61. In all cases where a bill, order, motion or resolution shall be entered on the journal, the name of the member introducing or moving the same shall also be entered on the journal.

RULE 62. The yeas and nays may be taken on any question whenever so required by any ten members (unless a division by yeas and nays be already pending), and when so taken shall be entered on the journal.

RULE 63. The journal of each day's proceedings of the house shall be printed, so that it shall be laid on the table of members within two days after its approval, and the sergeant-at-arms shall cause the printed journals to be kept on files in the same manner as other printed documents.

RULE 64. No reporter for the assembly, who has an appointment as reporter in the senate, shall receive any order for stationery from the clerk of the assembly.

RULE 65. No standing rule or order of the house shall be changed, suspended or rescinded unless one day's notice shall have been given of the motion therefor, nor shall such change be made unless by a vote of a majority of all the members elected to the assembly; any such rule or order, however, may be suspended by unanimous consent. But such notice shall not be necessary on the last day of the session. The notice and motion shall in all cases state specifically the object of the suspension, and every case of suspension of a rule under such notice and motion shall be held to apply only to the object specified therein. Nor shall the forty-second rule, as far as it applies to any bill requiring a two-thirds vote, be altered, rescinded or suspended, unless two-thirds of all the members elected to the house agree to such alteration, rescinding or suspending. Notice of a motion to suspend a rule shall be given under the order of business in which the matter proposed to be advanced by the suspension shall stand.

RULE 66. The following committee shall each be entitled to one clerk and messenger; to be appointed by the speaker:

1. Ways and means.
2. Judiciary.
3. Cities.
4. Canals.
5. Railroads.
6. Commerce and navigation.

And the following committees shall each be entitled to one clerk and messenger jointly:

7. Insurance, two-thirds and three-fifths bills, game laws, and rules.
8. Banks, general laws, agriculture, and expenditures of the executive department.
9. Claims, State prisons, and Indian affairs.
10. Internal affairs, and charitable and religious societies.
11. Public education, joint library, and expenditures of the house.
12. Roads and bridges, and affairs of villages.
13. Public printing, militia, and civil divisions.
14. Trade and manufactures, grievances, and manufacture of salt.
15. Public health, petitions of aliens, and State charitable institutions.
16. Privileges and elections, federal relations, and public lands.

RULE 67. No persons, except members of the legislature, and the officers thereof, shall be permitted within the clerk's desk, or the rooms set apart for the use of the clerk, during the session of the house.

RULE 68. Whenever any person shall be brought before the bar of the house, for adjudged breach of its privileges, no debate shall be in order, but the speaker shall proceed to execute the judgment of the house without delay or debate.

RULE 69. No more than sixteen pages shall be allowed upon the floor of the assembly chamber at any one time. Each page shall be furnished with a numbered badge, and shall occupy a seat corresponding with his number, to be provided and designated by the sergeant-at-arms, who shall also select one of his assistants, whose sole duty it shall be to take charge of said pages and see that this rule of the assembly is not violated.

RULE 70. It shall be the duty of the stenographer of the assembly to be present at every session of the house. He shall take stenographic notes of the debates in the house and in committee of the whole; and shall furnish a copy of the same written out in long hand, to any member applying therefor, upon the payment to said stenographer of ten cents for each folio, which charge said stenographer may receive in addition to his fixed compensation. The stenographic notes of the debates shall be filed with the clerk, and shall form a portion of the archives of the house. The clerk of the assembly is authorized to furnish said stenographer with proper stenographic blank-books in which to record said debates, not to exceed fifty dollars for any annual session of the legislature.

RULE 71. All questions of order, as they shall occur, with the decisions thereon, shall be entered in the journal, and at the close of the session, a statement of all such questions and decisions shall be printed at the close of and as an appendix to the journal.

RULE 72. Any member requesting to be excused from voting upon the final passage of a bill or upon the passage of a resolution requiring the expenditure of money, may make, when his name is called, or immediately after the roll shall have been called, and before the result shall be announced, a brief statement of the reasons for making such request, not exceeding two minutes in time, and the house, without debate, shall decide if it will grant such request; but nothing in this rule contained shall abridge the right of any member to record his vote on any question previous to the announcement of the result.

STATE OF NEW YORK.

No. 7.

IN ASSEMBLY,

JANUARY 3, 1882.

JOINT RULES

OF THE SENATE AND ASSEMBLY.

ADOPTED 1876.

RULE 1. Each house shall transmit to the other all papers in which any bill or resolution shall be founded.

RULE 2. When a bill or resolution which shall have passed in one house shall be rejected in the other, notice thereof shall be given to the house in which the same may have passed.

RULE 3. Messages from one house to the other shall be communicated by their clerks respectively, unless the house transmitting the message shall specially direct otherwise.

RULE 4. It shall be in the power of either house to amend any amendment made by the other to any bill or resolution.

RULE 5. In every case of difference between the two houses, upon any subject of legislation, either house may request a conference, and appoint a committee for that purpose, and the other shall also appoint a committee to confer. The committee shall meet at such hour and place as shall be *appointed* by the *chairman* of the committee on the part of the house requesting such conference. The conferees shall state to each other verbally, or in writing, as either shall choose, the reasons of their respective houses, and confer freely thereon. The committee shall report in *writing*, and shall be authorized to report such modifications or amendments as they think advisable. But no committee on conference shall consider or report on any matters except those directly at issue between the two houses. The papers shall be left with the conferees of the house assenting to such conference, and they shall present the report of the committee to their house. When such house shall have acted thereon, it shall transmit the same, and the papers relating thereto, to the other, with a message certifying its action thereon. Every report of a committee of conference shall be read through, in each house, before a vote is taken on the same.

RULE 6. It shall be in order for either house to recede from any subject-matter of difference subsisting between the two houses at any

time previous to conference, whether the papers on which such difference arose are before the house receding, formally or informally; and on such vote to recede the same number shall be required to constitute a quorum to act thereon, and to assent to such receding, as was required on the original question out of which the difference arose.

RULE 7. After each house shall have adhered to their disagreement, the bill which is the subject of difference shall be deemed lost, and shall not be again revived during the same session in either house.

RULE 8. All joint committees of the two houses, and all committees of conference, shall consist of three senators and five members of assembly, unless otherwise specially ordered by concurrent resolution.

RULE 9. No bill which shall have passed one house shall have its final reading in the other in less than two days thereafter, without the consent of two-thirds of the members thereof present; and whenever ten or more bills shall be in readiness for final reading in either house, such house shall forthwith proceed to the final reading of such bills, under the order of "third reading of bills," and continue the same from day to day until all such bills, then in readiness for final reading, shall have been read, unless this order of business shall, by the vote of two-thirds of the members present, be suspended or laid on the table. All such bills shall, have their last reading in each house in the order in which the same shall have been ordered to a final reading in such house, unless the bill to be read be laid on the table. In all cases where a bill shall be so ordered to lie on the table, it shall retain its place in the order of the final reading of bills, but shall not be called up for consideration unless by a vote of a majority of the members present.

RULE 10. The same bill shall not, specially or by name, create, renew or continue more than one incorporation, nor contain any provisions in relation to the altering of more than one incorporation by name; but this rule shall not be construed to apply to corporations to be formed under general laws according to the eighth article of the Constitution, nor to bills for consolidating corporations. After any bill has been reported by a committee, no amendment shall be made thereto which introduces an entirely new and different subject-matter from the subject-matter of the bill reported.

RULE 11. Whenever there shall be an election of officers by the joint action of the two houses, the result shall be certified by the president of the senate and speaker of the assembly, and shall be reported by the presiding officer of each house to their respective houses, and be entered on the journals of each, and shall be communicated to the governor by the clerks of the two houses.

RULE 12. There shall be printed, of course, and without order, 639 copies of all original bills reported by committees of either house, and 800 copies of all messages from the governor (except messages certifying his approval of bills), all reports of standing or select committees, and all reports or communications made in pursuance of law, and 796 copies of the journal of each house, which number shall be denominated the usual number.

RULE 13. Neither house shall order the printing or purchasing of books for the use of members or for distribution, except by joint resolution, upon which the ayes and noes shall be called, and which must receive the votes of a majority of each house; and no printing shall be done by order of either house, which is not embraced in the con-

tract for doing the public printing. Whenever either house shall order more than the usual number of any message or document, the fact shall be communicated immediately by message to the other. Whenever extra copies of any document, or publication of any kind, shall be ordered printed, the printer shall be authorized and required to deliver to the trustees of the State library at least five copies in addition to the number so ordered, for the use of the said library; and whenever more than five hundred copies are so ordered, the printer shall in like manner furnish five additional copies for each five hundred, for the purpose of literary exchanges.

RULE 14. When the same document shall by separate orders be directed to be printed by both houses, it shall be regarded as but one order, unless otherwise expressly directed by either house.

RULE 15. In the distribution of documents, the governor and elective State officers, and State officers appointed by the governor and senate, or elected by joint or concurrent action of the two houses, adjutant-general and the clerks of the two houses shall each have the same number as each of the members; and a specified number may be added for any committee, officer or author of a document.

RULE 16. The superintendent of documents of each house shall receive from the printer all matter ordered by the respective houses, and shall keep a book and enter therein the time of reception by him of every such bill or document, and the number of copies received, and shall cause each and any of such bill or document to be immediately placed on the desks of the members.

RULE 17. There shall be printed six hundred and thirty-nine bills, and distributed as follows :

To the senate	150 copies
To the assembly	450 copies
To the State officers	28 copies.
To the State library	1 copy.
Retained to bind	10 copies

There shall be printed three hundred and ten messages and documents, and distributed as follows:

To the Senate	80 copies.
To the assembly	199 copies.
To State officers	30 copies.
To the State library	1 copy.

There shall be printed three hundred journals of each house, and distributed as follows:

To the senate	80 copies.
To the assembly	188 copies,
To the State officers	30 copies.
To the State library	2 copies.

There shall be printed to bind four hundred and ninety-six journals of each house, and the same number of messages and documents, and distributed as follows:

For the senate	38 copies.
For the assembly	140 copies.
For senate library	16 copies.
For assembly library	50 copies.

For the counties and public officers.....	123 copies.
For literary and scientific exchanges, to be made by the regents of the university, including one copy for each State and territory, and one copy for each of the regents who are not otherwise provided for	124 copies.
For State library	5 copies.

There shall also be printed and bound for the State library five copies of the Session Laws, and also of the journal of each house, and fifty-five copies of the same, for the regents of the university, for the purpose of literary exchanges.

The clerk of each house shall forthwith, after the journal thereof of each day is approved, deliver a legible copy thereof to the printer for the two houses, who shall have the same printed and delivered to the sergeant-at-arms of each house within forty-eight hours thereafter.

RULE 18. There shall be a standing committee, consisting of three members of the senate and five members of the assembly, to be called the joint committee on the State library and cabinet of natural history.

RULE 19. The supply bill and the annual appropriation bill shall be reported by the fifteenth day of March, and printed immediately thereafter, and made the special order for the twenty-fifth day of March, or some day prior thereto, immediately after the reading of the journal.

RULE 20. No bill introduced after the fifteenth day of March in either house shall have its final reading in either house until all bills previously introduced in either, and sent from one house to the other house for concurrence and ready for third reading, shall be disposed of, unless by unanimous consent, except the supply bill and the annual appropriation bill; and the clerk of each house shall note on such engrossed bill the day on which it was introduced, and the day on which it was received from the other house, and shall announce such facts when the same is proposed to be read a third time.

RULE 21. When a bill originated in the senate or assembly shall have been lost in either house, neither the same nor any other bill on the same subject, and containing similar provisions, shall be subsequently introduced into the senate or assembly during the same session, unless by unanimous consent.

RULE 22. The postmaster of each house shall weigh and stamp all documents sent by mail or express, and enter in a book to be kept by him for that purpose, the amount of postage or express charge thereon, and report to the clerk of the respective houses the aggregate thereof weekly; and the assistant postmaster of each house shall enter in a book to be kept by him for that purpose an accurate account of all documents, with the postage or express charges paid thereon, transmitted from the post-office of their respective houses by mail or express, and report the aggregate thereof weekly to the respective clerks of the senate and assembly; and the clerks of the senate and assembly shall, from time to time, furnish to the postmaster of each house, respectively, the stamps requisite for carrying into execution this rule, and an account thereof shall be kept by them in books to be by them provided for that purpose; and the books kept by the postmaster and assistant postmaster, above specified, shall be, at all times, open to the inspection of the clerks and members of each house respectively.

STATE OF NEW YORK.

No. 8.

IN ASSEMBLY,

FEBRUARY 3, 1882.

REPORT

OF THE SUB-COMMITTEE OF THE COMMITTEE ON COMMERCE AND NAVIGATION, AUTHORIZED TO INVESTIGATE THE BUILDING AND LEASING OF DOCKS, PIERS, BULK-HEADS AND MATTERS RELATING THERETO, IN THE CITY OF NEW YORK.

ALBANY, January 10, 1882.

To the Assembly of the State of New York:

The undersigned have the honor to present the following report of the committee appointed in pursuance of resolutions adopted by the assembly, respectively on March 24 and May 5, to investigate the subject of leasing and building of piers in the city of New York, and matters relating thereto, as follows:

Resolved, That the committee on commerce and navigation be directed to investigate the subject of the leasing and building of piers in the city of New York, and matters relating thereto; that the committee be authorized to sit in New York and send for persons and papers, and employ a stenographer at a compensation not to exceed fifteen cents per folio.

Adopted March 24.

And the following:

Resolved, That the committee on commerce and navigation, authorized to investigate and examine the subject of leasing and building docks, piers and bulk-heads, and matters relating thereto, in the city of New York, be empowered to employ an expert and stenographer to assist said committee in the discharge of its duties, which shall include all matters relating to the department of docks of the city of New York. The said committee is hereby authorized to continue said investigation and examinations during the recess of the legislature, with full powers to send for persons, books, vouchers and all papers, and to report to the next assembly on or before the 10th day of January, 1882, with the evidence taken.

Adopted May 5.

[Assem. Doc. No. 8.]

The committee have held its sessions in the city of New York, and examined eighty-nine witnesses, representing the shipping, steamship and canal-boat interest, the maritime and produce exchanges, dock-builders, harbor-masters and others who have had business relations with the dock department, or the water privileges of the city of New York. They suggested to the committee a variety of inquiries touching the subject-matter of our investigation, and the committee have endeavored to make the investigation as thorough and complete as possible. At the outset, your committee discovered that there was a conflict of interests touching every subject likely to come before it for examination.

The first question taken up was that of shedding piers and bulkheads. A number of gentlemen connected with the Maritime Association and Produce Exchange, and others engaged in the shipping interest, appeared before your committee, as the testimony will show, and complained that, under chapter 249 of the Laws of 1875, the dock commissioners had leased nearly all of the piers available for heavy-draft sailing vessels to the steamship companies, so that only a few were left for general commerce. In many instances, as the evidence shows, ships, with cargoes consigned to the city of New York, were obliged to unload at piers in Brooklyn, and that it has frequently happened that vessels have been obliged to wait for days — and in some cases weeks — before they could obtain berths to discharge cargo. Many witnesses who testify upon this question express the opinion that the dock commissioners have been protecting foreign commerce at the expense of American shipping, coasting and local commerce; and the testimony upon the subject justifies the cause of complaint. Under the act of 1875, whenever a party or association leases a wharf or pier in the city of New York, and that wharf or pier is shedded, under the direction of the dock commissioners, it becomes, to all intents and purposes, during the period of the lease, the private property of the lessee. The lessee has the exclusive and absolute use of and control over such pier, and can determine the rate of wharfage that shall be paid by any person desiring a berth at such pier; and unless such demands are acceded to and paid as they see fit to charge, and notwithstanding there may be vacant berths at such piers, the vessel is not allowed to load or unload at that pier. In this connection, upon the statement made by the commissioners to your committee, there are but five or six unshedded piers upon the North river, and they are unfit for heavy-draft vessels to land or unload at. The North river, prior to 1875, was practically given over to regular lines of steamship and railroad companies.

By the act of 1875 all deep-water piers upon the East river were reserved for sailing vessels regularly "employed in foreign commerce," and having a draught of more than eighteen feet of water. Several of them, however, have been shedded.

Your committee desire specially to call the attention of the legislature to the fact that the words "foreign commerce" used in the

act of 1875, seem to be an unjust and, unfair discrimination against the American shipping interest.

Your committee would recommend the repeal of that provision of the act of 1875 which permits the leasing of bulk-heads, and the building of sheds thereon, or the anchorage of scows between piers upon the North and East rivers; and that every fifth pier hereafter constructed upon the North river shall be reserved for general commercial purposes; and as the present leases expire the same rule shall apply to them.

Your committee is of the opinion that the shedding of piers on the East river, and the want of accommodations upon the North river for local commerce, is a great detriment to the port of New York; and prompt action should be taken by the legislature to adopt measures of relief.

The gentlemen representing the steamship interests, by their testimony convince your committee that for the accommodation of their business they require shedded piers. But the privilege granted to the steamship companies of allowing them to shed piers has in nearly every instance been abused by the lessees, in that they have used the piers for storage and other purposes, in direct violation of section 4 of chapter 249 of the act of 1875. The evidence shows that most of the companies hold out as an inducement to foreign shippers the fact that their merchandise may be stored at this port for days and weeks without extra charge; and in one case a witness testified that their company had actually charged storage on goods that had been stored on the second floor of their shed, which is also a violation of the rules of the dock department, which require all goods to be removed within forty-eight hours. It is in evidence that the several foreign steamship companies have formed an organization for their protection. This was admitted by the representative of one of the largest steamship companies, who stated before the committee, that the organization was for the purpose of regulating the delivery of goods to consignees, and the removal and regulating the consignment of goods to the consignees. The understanding, it was stated, was only known to those who were in the organization; and while it was admitted that there were printed rules and regulations, the witness declined to produce a copy of such rules and regulations, or to state, more specifically, for what objects the organization was formed.

The steamship companies have also monopolized the bulk-heads adjoining their piers, and the space between West street and the new bulk-head line, a distance of 250 feet from the street. Personal visits of the committee along the water front of the North river disclose the fact that nearly all the space between West street and the new bulk-head line is occupied and incumbered by steamship companies with casks, pig iron, crates, lumber, ballast, and other materials, and have been so occupied and incumbered ever since the several sections were completed by the dock department, a period of several years, for which the dock department receive no revenue.

(See report of city wharfingers, annexed.) In consequence of such incumbrances there is scarcely a bulk-head remaining upon the North river for the accommodation of any other than steamship companies occupying adjoining piers. The testimony upon this subject shows that the dock commissioners have repeatedly passed resolutions directing the removal of incumbrances; and when they have not been rescinded, the officers authorized to enforce the orders have been verbally informed they need not execute them. The vascillating course of the commissioners in treating this matter has been the cause of much trouble to them, inconvenience to the people and profit to the steamship companies. As a proof of which, it appears in the evidence that the board passed a resolution directing the wharfingers to notify all of the parties having incumbrances upon the piers to remove the same upon the 23d of February, 1881, and that on the 25th of March, of the same year, they rescinded said resolution.

The use of the piers and bulk-heads for the storage of merchandise until delivered has grown into a habit at this port, and it raises the question for consideration, what additional facilities ought to be provided to accommodate the wants of commerce in this regard. The piers and bulk-heads exist for the accommodation of all commerce, and not for any special class, and all proper facilities should be provided for in the plan of improvement of the water-front, to reduce the charges upon the receipt and delivery of freight; and the time has come when the subject of the removal of goods at or near the points of receipt and delivery thereof must be taken up and carefully considered; but until this is done the committee are of the opinion that much less latitude should be permitted in this matter of incumbering the piers and bulk-heads, and some stringent and effectual measures adopted.

It is in evidence before your committee, that pier 1, in the city of New York, which is built of stone at a cost of over half a million of dollars, has been recently leased to a steamboat excursion company, who have put upon the same a double shed, which is of frequent occurrence, and have kept a restaurant; and are now charging the public an admission fee for entrance to said pier. That this is a direct violation of the lease of said company is admitted to be so by the commissioners; and your committee consider it only one of the many outrages to which the public are obliged to submit; that no proceedings have been taken to revoke the lease by reason of this violation, or to correct the abuses thereof. Your committee would strongly urge that an act be passed prohibiting any person from charging the public any admission fee for going upon any of the piers or bulk-heads of the city in New York.

It is in evidence before your committee that the ports of Boston, Philadelphia and Baltimore hold out special inducements to shippers and merchants as to the rates of wharage and other expenses attendant thereto, to increase their shipping interest. It is also in evidence that the charges at this port are exorbitant, and are almost

double and treble those of any other port; which, together with the terminal charges and other costs, seriously retard and affect the prosperity and progress of the shipping interest at the port of New York.

Unless a wise and liberal policy is adopted toward commerce with a view of facilitating and increasing it, we will eventually find that the ports just mentioned will control almost all the commerce of this country.

The port of New York having the greatest and most natural facilities for commerce, self-preservation would suggest that some effective measures, with proper penalties attached thereto, to enforce them, be enacted to protect it before it is too late.

It is in evidence before your committee that the piers which are being built at present and for some time past are bringing enormous rents, to the amount of some \$30,000 to \$35,000 per annum; and in one instance a witness stated that on behalf of his steamship company they were willing to pay as high as \$50,000 for a pier which had been leased for \$30,000, with the same privileges, to another company, which shows conclusively to your committee that there is a scarcity and lack of accommodations for the shipping interests.

It is a question in the minds of the committee as to whether this large revenue from these piers will eventually decrease commerce to such an extent as to have been a disadvantage instead of a benefit, all excessive rentals being a direct charge upon commerce.

The annual rental of most of the piers, especially of those occupied under new leases, is uniformly alike. But in determining the annual rental of other dock property there appears to be no fixed standard of value adopted by the dock department. It is in evidence that a bulk-head upon the North river at the foot of Twenty-third street, and 34,094 feet of land adjoining, was leased at public auction May 1, 1879, to May 1, 1881, at \$500 per annum, while the bulk-head and land at the foot of Thirty-third street, the same class of property, of some 29,000 feet, was leased November 1, 1873, to November 1, 1883, at the rental of \$5,000 per annum; whereas a short distance beyond, at the foot of West Forty-third street, the department rents for \$100 per year 23,480 feet. The commissioners have leased a great deal of dock property and water-front, at the pleasure of the board, yielding in many cases but a nominal rental. The annual rental of the property leased at the pleasure of the board, according to the figures of one of the present commissioners, is about \$58,000 on the North river and \$8,600 on the East river, making a total of \$66,600; and the land under the water on the North river \$15,550, and on the East and Harlem rivers \$7,500, making a total of \$89,650. In the opinion of this commissioner the amount should be double; while another of the present commissioners expressed the opinion that it should be three times that amount. It is in evidence before your committee that nothing practically has been done up to the present time to recover for the city the increased revenues which they testify should be paid.

The representatives of the canal interests appeared before your committee, and stated that they needed much more room for the accommodation of their business. The original canal district on the East river, as laid out by an act of the legislature some years ago, has been largely encroached upon, and a large portion of it taken for other purposes, thereby cramping them and their interests to some considerable extent. A number of witnesses on behalf of the Hamilton Ferry Company appeared before your committee, and they desired an additional portion of the canal district, which they claim they must have now, or eventually they would be seriously injured and could not accommodate their patrons. On the other hand, a petition very numerously signed by some of the largest grain merchants in the city and general dealers was presented to the committee, strongly protesting against the removal of the canal district. A number of witnesses were examined as to the feasibility or practicability of removing the present canal district to some other point on the North or East river. Your committee have no recommendations to make in this particular. But we believe that the time will soon arrive when such removal will be a matter of necessity; and the evidence presented with this report upon this subject may be of interest and value to those whom it directly affects.

In conducting the investigation as to the management of the dock department, its methods, employees, the cost of building the bulkhead wall, and the general details of this branch of our examination, it has been difficult in the extreme, and in fact almost impossible to obtain any reliable or definite data from which a satisfactory conclusion might be drawn, from the fact that no two persons connected with the department agree upon any general subject.

The report of the experts of your committee gives a full and general statement of the deficiencies, defalcations, and various other errors connected with the book-keeping, finances and other matters pertaining to the department. They are very full and complete, and it affords the committee pleasure to state that the experts employed have performed their laborious duties with great diligence, fidelity and satisfaction to the committee; and we may be pardoned if we state here that our thanks are due them for the willing and cheerful manner in which they have performed the many services required of them.

The books of the department were found to have been kept in a very loose manner, no entries being made for months at a time in the cash book. From the month of September, 1880, to the month of May, 1881 (the time when your committee went to the department to make the examination), no entries had been made.

The defalcations of the former book-keeper of the department, Mr. Burnham, began in June, 1875, and ended in the early part of 1878; and they amounted to the sum of \$42,292.56, of which the commissioners, Westervelt, Dimock and Vanderpoel, paid into the department \$4,925 each, making a total of \$14,775, and leaving a balance due the city from that source of \$27,007.56. The balance

of his account was charged up in various items upon the books of the department, the balance being charged to the account of the counsel of the corporation for collection; but as prior thereto Mr. Burnham had been indicted and fled, no service has ever been had upon him for the purpose of suit. Since the 30th day of April, 1881, Commissioner Vanderpoel has paid in addition upon said account the sum of \$621.61; and the sum of \$26,385.95 remains unpaid at this date. This defalcation continuously occurred during a period of about three years. From the testimony of the experts it is somewhat doubtful if the peculations of Mr. Burnham will ever be fully known; and, considering the fact that he is deceased, and also the treasurer under whose administration the larger portion of the defalcation occurred, it is doubtful if any part of that amount is ever recovered. For a detailed statement of this subject we refer you to the report of the experts.

We have carefully considered the questions arising out of the defalcations of the former book-keeper of the department, Mr. Burnham. The law seems to place the legal responsibility for the collection and safe custody and deposit of the moneys upon the treasurer of the board.

The charter of the city, by section 89, provides that "Each board may, except as herein otherwise provided, choose, in its own pleasure, one of its members, who shall be its president, and one who shall be its treasurer."

The office of treasurer seems to involve the conduct and safe management of the money transactions of the board, and the by-laws of the department had defined the duties of the treasurer to be to "collect, receive and pay over semi-weekly to the city chamberlain all rents for the use and occupation of the wharf and slip property of the city of New York, and all fines and penalties imposed by the department of docks, and all other moneys payable to said department."

These defalcations occurred under the treasurerships of William Budd, Jacob A. Westervelt and Jacob Vanderpoel.

The committee are agreed that there has been great negligence in the conduct of these affairs by the respective treasurers.

It is proper to say for them, that Mr. Burnham had, for a long time prior to the organization of the dock department as a separate department of the city government, charge of the collections of the wharf and pier rents in the comptroller's office, and down to the time of the discovery of these defalcations, had the entire confidence of those who knew him as a man of truthfulness and honesty.

Much of the moneys taken by Mr. Burnham consisted of sums received for wharfage, and entered on the books of the department, but never deposited with the city chamberlain. Collectors at that time of wharf rents were required to make daily returns of the same, and also weekly returns, the latter being required to be sworn to. Some of these returns were found to be of irregular date, not sworn

to ; some of them made out in pencil, and a few of them lost. In one case, a period of over fourteen weeks, in one district, no returns were made ; and a subsequent return bore upon the back of it the statement that no collections had been made during that time. Some of them bear no dates at all, and two were found lying loosely in a desk drawer, with neither amount nor date, and signed in blank by the collectors. Others were certified to by a notary with no signature of the collector. There are numerous returns that should have been made from 1875 to September 15, 1878, that do not appear either on the cash-book or anywhere else. The chief clerk of the department was requested to produce these, and he stated that they were not on file, although shortly afterward he did discover one of them, and turned that over to the commissioner of accounts who was then examining the department. One sum of \$700 was charged to the counsel of the corporation.

Your committee desire to call attention to the report of the experts on the pay-rolls of the department and the system of keeping them ; and also of the cash receipts and payments that were treated as off-sets, from the year 1870 to 1872. They desire to specially refer to the report of the experts as to the account between the city chamberlain and the department, wherein it appears that deposits of money which are charged in the dock department books as having been deposited, while the fact appears from the date of the chamberlain's receipts, that many days elapsed between, and in very large amounts ; and in the department year of 1881, but nineteen deposits were made by the treasurer with the city chamberlain, notwithstanding the fact that one of the by-laws of the board already quoted requires that the money shall be deposited semi-weekly by the treasurer. This seems to have been the practice for several years past ; large accumulations of money being allowed to remain in the hands of the treasurer, extending from the sum of \$12,000 to \$125,000 at one time, and which the treasurer knew nothing about, which your committee believes offers every inducement to any dishonest employee to commit a defalcation ; and it was not until the commissioners' attention had been called to it by a letter from the experts that this practice has been changed.

The committee also call special attention to the report on the dock fund, which is exhaustive ; in which it appears that there is a difference between the dock department and that of the comptroller, amounting to over \$85,000. Up to 1878 no account of the dock fund had ever been kept upon the books of the department ; no accounting between these respective departments ever seems to have been had ; nor is any explanation given of this difference in their respective accounts.

Various charges were made by the dock department against the law department, but the same were subsequently substantially withdrawn. (See correspondence between these departments.)

Much evidence has been presented to your committee upon the question of cost of what is known as the bulk-head wall, a stone wall

which is being built around the city water-front. An examination of the report of the experts will give the various statements of the department engineer and other employees, as well as of their own examination; in which there seems to be a difference of about \$100 per lineal foot. Other parties appearing before your committee have asserted the fact that it costs something like \$500 per lineal foot, and that it is impossible for them to know what it costs.

Evidence is also before your committee tending to show that walls equally as durable or good can be built at a much lower price. This is a matter which we commend to the attention of the legislature.

We would specially recommend that such laws be passed as would place the dock department upon the same foundation and management as the other departments of the city of New York, and we can see no reason why such should not be the case.

It is in evidence that but one examination of the dock department has been made by the public accountant since it was organized up to the present year. In that examination, part of the Burnham defalcation was discovered; and although a report of that fact was made known to the mayor, no further examination was made of the department. The public accountant testified that he went to the department to make a subsequent examination, but it was abandoned, as the testimony shows, at the request of the mayor. Your committee would recommend the passage of an act requiring the public accountant to examine every department in the city of New York at least once a year, as we believe such a practice would have a tendency to prevent any future defalcations.

In conclusion, we have only to add that all the sources of information that would lead to an intelligent and satisfactory conclusion have been exhausted. The recommendations made are founded solely upon the testimony before us.

Respectfully submitted,

ARTHUR D. WILLIAMS,
Chairman.

JOHN W. BROWNING,
PATRICK J. TULLY,
DAVID A. WELLS,

Sub-Committee on Commerce and Navigation.

SECOND ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

NEW YORK.

TRANSMITTED TO THE GOVERNOR FEBRUARY 8, 1882.

ALBANY:

WEED, PARSONS AND COMPANY, PRINTERS.

1882.

STATE OF NEW YORK.

No. 9.

IN ASSEMBLY,

February 8, 1882.

SECOND ANNUAL REPORT
OF THE STATE BOARD OF HEALTH.

STATE OF NEW YORK,

EXECUTIVE CHAMBER, }
ALBANY, February 8, 1882. }

To the Legislature:

Herewith is transmitted the Second Annual Report of the State Board of Health, ending December, 1881.

ALONZO B. CORNELL.

[Assem. Doc. No. 9.]

THE STATE BOARD OF HEALTH OF NEW YORK.

MEMBERS AND OFFICERS OF THE BOARD.

State Commissioners of Health ; appointed by the Governor and Senate.

HON. ERASTUS BROOKS, West New Brighton, Richmond Co.

J. SAVAGE DELAVAN, M. D., Albany.

ELISHA HARRIS, M. D., New York, P. O. address, Albany.

Appointed by the Governor, from the Health Commissioners in Cities.

EDWARD M. MOORE, M. D., Rochester.

PROF. CHARLES F. CHANDLER, Columbia College, New York.

JAMES G. HUNT, M. D., Utica.

Ex-Officio Members.

WM. M. SMITH, M. D., Health Officer of N. Y. Quarantine, S. Is'd.

JAMES T. GARDINER, Sup't of State Survey, Albany.

HON. LESLIE W. RUSSELL, Attorney-General, Albany.

OFFICERS OF THE BOARD.

President,

DR. EDWARD M. MOORE, Rochester.

Secretary,

DR. ELISHA HARRIS, Central Office of the Board, Albany.

State Superintendent of Registration of Vital Statistics,

DR. HARRIS, as Secretary of the Board.

CONTENTS.

	PAGE.
Membership and Officers of the State Board of Health.....	v
General Report of the Board.....	1- 48
Abstract of Minutes and Transactions.....	49- 67
Report of Executive and Finance Committee.....	68- 75
Report of Committee on Registration and Vital Statistics....	76-126
Records and Investigations of Prevalent Diseases.....	78-111
Sanitary papers relating to Prevention and Control of Con- tagious Diseases.....	112-126
Report of Standing Committee on Public Institutions.....	127-184
Notes and Conclusions upon the results of the Inspection of Schoolhouses	185-187
Report upon School Hygiene, by Dr. D. F. Lincoln	188-233
Report of Standing Committee on Quarantine, external and internal.....	234-280
Report of Committee on Drainage, Sewerage and Topography,	281-329
Report on Methods of Sewerage for Cities and large Villages, by James T. Gardiner	321-335
Report of Committee on Effluvium Nuisances.....	327-390
Duties of the Citizen to the State in Maintaining Public Health,	391-400
Modes and Examples of Sanitary Procedure.....	401-409
Contagious Disease Refuges and Temporary Hospitals.....	411-416
Organization Powers and Duties of local Boards of Health, Act for the preservation of public health.....	417-421
Act to establish the State Board of Health.....	422-425
Reports by the Sanitary Committee.....	427-695
Report on Chemical Examination of Drinking Water.....	427-448
Report on Methods and Apparatus for Testing Inflammable Oils.....	449-496
Reports on Adulteration of Food and Drugs.....	497-695
Act for establishing the Safety Standard and Tests of Illumi- nating Oils, chapter 292 of 1882.....	492-495

	PAGE.
Act for preventing the Adulteration of Food and Drugs, chapter 407, of 1881.....	497-695
Prof. Chandler's Report on Results of work of the Analysts..	501-509
Prof. Caldwell's Report on Butter, Cheese and Fruit Essences,	509-547
" " " on gelatine and Sugar-Coated Pills..	688-691
Prof. Chester's Report on Canned Meats, Animal Foods, etc.,	548-558
Dr. E. G. Love's Report on Cereals, and the products and accessories of Flour, etc	559-589
Prof. S. A. Lattimore, Report on Canned Fruits and Vegetables, etc.....	590-595
Prof. Pitt's Report on Sugars, etc., by Dr. W. H. Pitt..	596-601
Report of Albert L. Colby on Sugars, etc.,	601-618
Dr. Englehardt's Report on Wines, Beers, etc.....	619-678
Dr. Hoffmann's Report on Crude Vegetable and Animal Drugs; and Pharmaceutical Chemicals and their Preparations	679-688
Prof. Caldwell's Report on Quinine Pills, Gelatine, etc.....	689-691
Prof. W. G. Tucker's Report on Granular Effervescent Salts,	692-695
Index.....	709-718

State Board of Health of New York.

SECOND ANNUAL REPORT.

To HON. ALONZO B. CORNELL, *Governor of New York*:

SIR — In the report submitted a year ago this Board presented outlines of the several branches of sanitary work it had organized during the first half year of its service. The report now presented will show what progress has been made in the work during the year ending December 1, 1881.

The first duties which the laws have imposed upon the State Board of Health require that in taking cognizance of the interests of health and life among the people of the State, it shall make inquiries in respect to the causes of disease, especially of epidemics, and investigate the sources of mortality. The obligations of the Board to obtain, preserve and use such information, and by all suitable means to aid the people in their local sanitary organization and duties, have become generally well understood throughout the State. The town and village authorities have been steadily organizing and perfecting the local health boards, and availing themselves of the provisions of recent laws, they freely seek whatever information and assistance the State Board can give. In this respect the constituted local authorities of towns and villages are evincing their worthiness of the trust which successive Legislatures repose in them. The organized townships and cities being the units of which the State is composed there is abundant reason for testing the willingness and ability of local sanitary authorities to perform the duties now required at their hands under the existing laws relating to the public health and vital registration. Without hesitation the State Board of Health has thus far endeavored to take all possible advantage of these laws in their obvious meaning, and of the best provisions of the local government organizations as found at the time available in the towns, cities and villages, for giving practical effect to these laws, so far as this Board may participate in or usefully influence the administration and execution of them.

In this report the action taken by the Board during the year, the information obtained by it, the vital statistics and the sanitary condition and prospects of the State will be concisely presented under the following heads; and for the purpose of completing the information which should herewith be submitted, classified statements and special.

reports are hereto appended as a body of evidence in which the connected points of review and suggestions, as here submitted by the Board, will be fully sustained :

I. Prevalent Diseases.—Small-pox, Diphtheria, Scarlet Fever, Typhus and Typhoid Fevers.

II. Distribution and Local Government of the Population.— Local Boards of Health.

III. The New Sanitary Laws.— Chapters 407 and 431 of 1881.

IV. Reports of the Committees.

V. Investigation and Prevention of Stench Nuisances.

VI. Procedures under the eighth section of the State Board of Health Act.

VII. Laws and Sanitary Provisions relating to Small-pox and Vaccination.

VIII. Impure Water Supplies. Pollution of Wells and Streams.— Water Analysis.

IX. The General Drainage Laws.

X. Sanitary Drainage of Villages, and the Treatment of Drainage areas in populous districts.— Disposal of Domestic Waste Matters.

XI. Public obstructions to Natural Drainage. Sanitary questions connected with the Abandoned Canals, and the Malarial Grounds near the Erie canal.

XII. The extent of Preventable Causes of Malaria in the State.

XIII. Sanitary Inquiry relating to Prevalent Acute Diseases.

XIV. The State System of Registration of Births, Deaths and Marriages.

XV. Expert Services.

XVI. Health in the Schools.

XVII. Tenements.— Protection of Health and Life of Tenants.

I. PREVALENT DISEASES.

Healthful and prosperous as the past year has been in the State of New York, those acute contagions which are the enemies of child-life, have prevailed in a great many localities, and, as usual, have desolated thousands of homes. Scarlet fever, diphtheria, small-pox, the most conspicuous of these enemies, have not limited their prevalence to the crowded cities, and the poorer classes in villages; but they have been especially malignant and fatal in rural neighborhoods, and even in the remotest districts. As the year is now closing, diphtheria and small-pox are being reported as in progress in remote hill districts where sanitary safe-guards against such evils have been least thought of hitherto. The more we know of the places and habits of these contagious maladies the more conclusive is the evidence that whatever may

be the importance of local conditions that promote their propagation, the *contagia* or communicable poisons which they produce and spread abroad, must be controlled and "stamped out," as the very first sanitary duty by public health authorities.

The conditions under which contagious and other fatal diseases become localized are well understood, and the diseases themselves which depend upon these conditions for their persistency and greatest public harm are now justly termed filth diseases, foul-air diseases, and the endemic, epidemic and contagious kinds of disease.

Endemic and epidemic fevers, which have for ages had a written history, still prevail under conditions not unlike those that have found their record in ancient story and in the annals of the districts where marshes, neglect of drainage and sewerage, sodden grounds and predominating uncleanness have propagated miasmatic and filth diseases.

The increasing prevalence of miasmatic diseases during the past few years in New York, and other States in our latitude, is receiving careful attention from this Board, and from some other State Boards of Health.

The frequent recurrence of small-pox in communities that were presumed to be as well protected as others against it; the outbreak of diphtheria in widely separated towns and villages; its fatal persistence in several of the cities through the last fifteen years, and its recurrence again and again in the same towns, in the same valleys, and upon the same hillsides, or in particular neighborhoods, where, within the last twenty years, it appeared for the first time in the present century, are supplying facts which seem to show either that the sanitary measures hitherto adopted were not in any sense adequate to the extermination of the causes of this disease, or that it prevails so capriciously that ordinary sanitary measures may not reach its causes.

The appearance of scarlet fever in every county in the State, and its varying but always terrible fatality and dreaded consequences, and the frequent prevalence of measles and whooping-cough which destroy a vast number of children's lives annually in the State, by the fatal effects they produce upon the respiratory organs; these, when counted together, are found to be charged with a very large percentage of the total mortality, year by year. The diseases here enumerated are not altogether to be accredited to filth and foul air; they are contagious diseases, and spread by their own specific poisons. Hence, they will all admit of a certain degree of definite sanitary control; and as hygiene and medical philosophy, founded on exact experimentation and research, now teach, there may be no plainer or imperative sanitary duty imposed on health boards, physicians and householders than correctly to understand, and promptly to apply, the known resources of

hygiene to the control and extinction of the contagious elements upon which these harmful diseases so largely depend. As regards small-pox, diphtheria, scarlet fever, and the typhus and typhoid fevers, these are plain sanitary duties; and in this report we summarize them under the heads: (1.) Isolation and Quarantine. (2.) Cleansing, Disinfection and Extinction. The reports of the standing committees on Vital Statistics and on Quarantine present certain public aspects and results of these duties.

This Board has thus far rarely had difficulty in its efforts to induce local boards of health to make it an invariable duty to enforce all needed obligations for the domestic or local quarantine, disinfection and cleansing which are adapted to and necessary for protection against each of the contagious diseases.

The amended general law prescribing the organization and powers of local boards of health (chapter 431 of 1881), confers on every local board adequate authority, and prescribes the necessary safeguards, for the exercise of such powers, for the suppression and extermination of sources of contagion. The circulars of information prepared and issued by this Board, supplying to all health officers and boards of health having need of sanitary information and advice in regard to the acute kinds of contagious diseases, and the treatment of infected persons, places and things, have been sought after and made practically available in the warfare against these enemies of households and communities. The first issued relates to diphtheria, and, though designed for communities that were in great alarm and peril, remote from physicians, and without the jurisdiction of any local board of health, has become the most useful and necessary of all in this list of circulars of information and advice. This, as well as the others — six in number — will be found hereto appended.

Essential facts relating to these diseases.— Important progress is being made in the knowledge of causation of the destructive contagious and infectious maladies. The wonderful disclosures in inoculation, as practiced in the time of Lady Wortley Montague, and by vaccination, the great discovery of Jenner, seem to have been but preludes to the discovery of certain fundamental facts relating to the means by which diseases most fatal and obstinate are rendered controllable. In respect to this matter, however, we may reasonably believe that sanitary and medical science is only upon the verge of great discoveries and definite rules of sanitary practice by which the human family shall be adequately guarded against the most destructive maladies. The National Board of Health is attempting to subordinate to the demands of sanitary science numerous expert investigators who already report conclusively practical results concerning the causes and spread of diphtheria.

Small-pox.— This disease, which marks its victim for life, is at last so well understood as an unmasked destroyer that its contagion is readily controlled and extinguished by definite rules of disinfection, and by enforcing the absolute isolation or quarantine which the local and State sanitary codes now require; vaccination, at the same time, presenting the boon of protection with as much claim to efficiency as it ever had. In special reports appended will be found practical illustrations of these subjects which all people should understand. It is for this reason they are introduced as a body of evidence. Small-pox continues to be a curse and a terror to the communities in which it appears, where neither vaccination nor adequate sanitary regulations are already in the line of defense against it. Perhaps nothing has occurred in the history of small-pox that is more instructive than the protection which the towns of Kingsbury, Fort Edward, Argyle and Caldwell obtained by means of sanitary organization, domestic and local quarantine, and, chiefly, by the complete defense which vaccination and revaccination secured. As the reports show, the Board of Health in the village of Sandy Hill (in the town of Kingsbury) called for, and gratuitously used, 1,250 vaccinal points, immediately upon notice of danger, in time to confront the peril from the nearest neighboring village—only three or four miles away—while the next contiguous and populous towns and villages secured immunity by the same means. The five towns which were most exposed to the contagion, that was rife in the populous village in their midst, as is shown by the reports, secured their immunity by promptly applying vaccination to several thousand persons, at a cost which is but a small fraction of the sum that was expended by the single rural town of Salem, in December and January last, in the attempt to control an outbreak of small-pox in the little hamlet of Shushan. The total cost of “stamping out” small-pox that was stealthily introduced into the town of Queensbury, and its chief village, Glens Falls, amounts to nearly \$8,000, while the entire expenditures upon the thorough vaccination and revaccination that protected the towns of Fort Edward and Kingsbury, and the village of Sandy Hill, amounted to but a few hundred dollars. The total and detailed results of vaccination, as studied by the officers of this Board, and now attested in every locality where this protective agency has been seasonably resorted to, seem to confirm all that Jenner and all enlightened physicians, from his day till now, have claimed for the place which vaccination holds in well regulated public health service.

Pure and trustworthy virus.— This Board directed three of its standing committees, as shown in the appended abstract of proceedings, to prepare a report upon suitable State supervision and sup-

plies of necessary vaccinal virus from inoculated calves; in other words, upon the subject of a "bovine or vaccine farm." Such a report will be expected from those committees early in the winter. It is deemed of the utmost importance that there should be the most trustworthy and ample supply, and the best methods of distributing it to local health officers, and for the gratuitous offering of it to the needy in the community, under suitable sanction. Precisely these duties are what is implied by this Board's action on the subject. It is simply renewing the memorable methods of the discoverer of vaccination in the careful culture and preservation of the full virtues of the vaccinal virus. Therefore, we respectfully commend the subject to your attention and to that of the legislature. A "bovine or vaccinal farm" consists of an organized arrangement for skillful selection, keeping and inoculation of heifers, the vaccinal vesicles upon the tender skin of their loins, being produced, at a great number of inoculated places, precisely as in the arm of an infant. Fortunately, there are several private establishments of this kind in the United States, but there is none in New York. The State of Maryland has, for several years past, maintained such an institution, and paid the expense for supplying pure virus gratuitously to all who will accept it in the State. The cost is not great, but the skill and precision required in the service should be perfect.

The Board mentions, with much satisfaction, that out of the several thousand supplies (points), of vaccinal virus for which it temporarily guaranteed the payment, wherever purchased (for bovine virus has been obtained at great disadvantage from several States to meet urgent demands) only a few dollars worth has, thus far, been required to be paid for from its funds. The largest amount so guaranteed for any one health board was for 1,250 points in a single town. The fact that health boards of towns and villages have no available funds of their own, but must await an auditing at some distant time, has rendered this mode of assistance to them quite important in the effort to afford general public protection against small-pox.

Diphtheria. — It is now twenty-three years since diphtheria appeared in a malignant form in the city of Albany and desolated an extensive district south of State street, in the old quarter of the city. It raged fatally for several months in that district, and had nearly disappeared before it was announced as prevailing elsewhere in the State. More than sixty years had then elapsed since it had prevailed in any part of the State, and then it was under the name of malignant sore throat, etc.; and it appears to have been perfectly described by the physicians of that period. Now it is known by the name given it in France in later times, Diphtheria; but, as a terrible domestic pestilence, no

name has yet defined its fatal *nature*. It was prevailing in various places when this board began to organize its duties in the summer of 1880. It had destroyed upward of 15,500 lives in the city of New York alone during the preceding twenty years, and in the years 1874 and 1875, 3,994 deaths were charged to this single cause. In the State of New York there had been destroyed in these last two decades a number terrible to contemplate,—upwards of 70,000, it is estimated,—and these were largely among the most promising and valued child-lives wherever the disease prevailed; for it is not more the pestilence of the poor than of the affluent.

In the report which this Board presented a year ago it is shown that diphtheria has prevailed in remote and even wilderness regions, among people sequestered from ordinary intercourse with populous districts; that the malady presented its malignant characteristics; and that, by whatever general conditions it may have been spread, there was absolute proof of its propagation from person to person, and from house to house, over long distances, by individual carriers of its propagating cause, though not themselves sick with it. In other words, diphtheria is a contagious disease, whatever may be the endemic and epidemic conditions which favor its propagation.

Though it is not for this Board to discuss medical questions in its report, it is important that the most essential truths relating to these and other contagious maladies should be unhesitatingly exhibited in the Board's policy and acts, and this may as well be stated here as anywhere in regard to this subject. The isolating or quarantining of the sick and the carriers of these contagious pests, and their virus, by disinfection and cleansing of all places and things that propagate or convey the contagious poison, are plain duties which should be enforced by every local board of health and by every physician and householder.

Diphtheria has continued to appear in widely separated districts, and in the most secluded as well as in the densest populations of the State. Perhaps there has been nothing in its history the past many years more distressing than its recent prevalence in certain districts of the upper Hudson, in Warren and Essex counties, remote from physicians, where the families of the hardy people have usually enjoyed an immunity from destructive diseases. Some details respecting this experience are appended in reports now submitted.

Scarlet fever.—This disease is probably more widespread and continuous in its presence than diphtheria, and possibly destroys more lives. It is perhaps less amenable to sanitary measures, which boards of health may control, than diphtheria. Like the latter disease it is the bane of crowded schools, and is a dreaded pest. Not only is its con-

tagious progress not easy to prevent by ordinary ventilation and the lapse of time, but it engenders secondary results so pernicious, and so often fatal, that it should be regarded as an enemy to be kept out of the dwelling, the family, the school and the community. The once popular idea that it is best to take the risk and "let the children have scarlet fever," should be no longer accepted. *It is best not to have it.* Its contagion, at least, should be kept far away from every habitation, school, vehicle and public assembly. The remains and funerals of its dead should expose no one to its contagion. In this respect the same rule should apply as in the case of the remains of the dead from small-pox and diphtheria.

Typhus fever.— Nearly a year ago, typhus, contagious and insidious in its march, was found to be prevailing among tramps. Officers of the State Board of Health of New Jersey discovered the disease at Camden and elsewhere, near Philadelphia, late in the autumn of 1880. It was soon found domiciled in a great company of wretched vagrants, in the "Tramps' Lodging House," near Broadway, on Prince street, New York. In a few weeks it was found to be spreading in several blocks of tenements; but having aroused the ever alert medical officers of New York City Board of Health, this threatened contagion was reported as extinguished before the first of July.

A brief account of it is given in an appended report. There is every reason to believe that this contagion did not gain a foothold through any failure of the New York quarantine establishment. The first cases in the State, and the connections of those cases are traced to another source.

Typhoid or enteric fever.— This type of filth-diseases has appeared in numerous places; yet has not, in most instances, had a deadly prevalence. It has come to be one of the diseases with which the common sense of the people grapples successfully wherever they consult and implicitly follow competent sanitary officers and enlightened physicians. Foul outflowing, neglected privies and excremental filth, polluted water, and even the daily milk supplied to families (when defiled by water which has received any of the infectious matter of enteric fever) now command attention wherever a first case of the malady is discovered. Variable in its degree of malignancy, and thus readily associated with other diseases and causes of disease, there seems to have been the greatest suffering and fatality from typhoid fever in regions where malaria is also present. Hence the very frequent communication of information to officers of this Board of outbreaks and fatal cases of what physicians recognize and frequently denominate as typho-malarial fever.

In order to obtain trustworthy information in regard to the extent

of localities and local conditions under which the prevalence of true malarial diseases has occurred during the past year, the Board directed its committee on Vital Statistics to make suitable inquiries by means of a circular addressed to physicians throughout the State. That inquiry is still in progress and promises important results. The committee that has it in charge reports, in a statement hereto appended, many instructive and interesting facts. This investigation of fevers and malaria will continue through the coming year. We make reference to it because of important relations to, and discriminations between, the deadly filth-disease known as the enteric or typhoid fever, and the disabling but less fatal fever-and-ague or malarial fever.

The committee's report shows that there is abundant evidence that malaria, so called, that is, the poison which produces periodical fever and various miasmatic maladies that are attributed to that paludal poison, has, in a recent period, made a wide departure from what were supposed to be the limits of its prevalence; and appears now to have extended further beyond the swamps and lowlands than in former years; yet it is so associated with swampy grounds and stagnant pools and with the foul margins of drying streams and ponds, that there appears to be no good reason yet for depreciating the correctness and importance of the common opinion that the conditions here mentioned are essentially concerned in the propagation of malarial disease. It is as necessary as it is easy to identify and fix the responsibility for the causes of filth-fevers, known as enteric or typhoid. It will be advantageous to the public health, and important to sanitary authority, if in the identification and hygienic management of endemic and epidemic diseases and their causes, all of their contagious and infectious attributes shall be brought under as definite control as their localizing and external contributing factors should be.

Other prevalent diseases.—The diarrhoeal diseases of children as they have prevailed in certain limited localities during the past season, and fatal miasmatic diseases, have received such attention from this Board, and from local boards with which it has communication, as has been required. The most important outbreak of enteric disease to which this Board's attention has been called occurred late in the season at a tomato-canning establishment in the town of Southfield, Staten Island; and, as many of the sufferers were recent immigrants, the Commissioners of Emigration invited the attention of the health authorities to them and to the important evidence of the personal neglect and the sanitary wants of the sufferers.

A full account of the facts is briefly given in the report now submitted by the committee on vital statistics. Dr. Carroll, an expert sanitary inspector, under instructions from this Board, has shown quite

clearly that both typhoid fever and dysentery prevailed upon the premises complained of, and that as regards the fever, it was introduced from abroad, and spread by its own infection under the favoring miasmatic conditions which prevailed upon the premises where some two hundred persons were employed. These workmen were lodged in crowded bunks at night, and seemed to have been utterly negligent and filthy in their personal habits. Dr. Carroll reports that the prevailing fever was of a miasmatic and adynamic type, and that it must be regarded as essentially a localized epidemic in a malarial spot.

House epidemics and other strictly localized outbreaks of fatal disease affecting the bowels, or otherwise seriously harming a great number within a limited area, have occurred in numerous places. At various points along the Erie canal, in the immediate presence of non-used or partially filled basins and obstructed water courses, where filthy outflowing of villages or of a few dwellings had intensified the miasmatic nuisances, the most striking illustrations of such local suffering have occurred. One of the most extensive areas that has been invaded by endemic bowel diseases, and far the largest population that has thus far suffered in any one locality in this State, we find described in the reports received from the city of Buffalo, where within geographical limitations that require further investigation, great numbers of lives were lost by diseases known to be preventable, and which, as reported, appear to have been caused chiefly by the needless faults in domestic water supplies. This subject is still under investigation, and some important evidence relating to it will be found in one of the reports hereto appended.

DISTRIBUTION AND LOCAL SANITARY GOVERNMENT OF THE POPULATION.

The tenth national census found 5,082,982 inhabitants in this State, and of these there were 2,506,959 living in the twenty-four cities; 1,803,254 were found in the four cities of the metropolitan district, namely, in the city of New York, 1,206,577; in Brooklyn, 560,698; in Yonkers, 18,892, and in Long Island City, 17,096. The chief city of the western border, Buffalo, contained 155,137, while in Albany, Troy and Cohoes, at the middle of the eastern border of the State, were found 167,067 inhabitants. The cities which are thus becoming greater are the first fields in which the care of public health presents the questions that have received more attention from the Legislature than has been given to the general promotion of sanitary protection. The city boards of health bear little resemblance to each other. They are as diverse as the caprice of the endless amendments of municipal charters can make them; yet New York, Brooklyn, Yonkers and Buffalo pre-

sented such reasonable claims to fitness of their respective modes of organization of municipal public health service that the last Legislature excepted them from the operation of that provision of the amendment of the general law for local boards of health, which defines the membership of a board.

The other cities in the State can avail themselves of that special provision and of all the powers which the Law of 1881 (chapter 431) confers. The Legislature thus opened the way, at least, for these twenty cities to improve and simplify their public health service.

The three hundred and twenty-six incorporated villages in the State are yet so identified with the interests and much of the responsibility of the local government of the townships in which they are situated, that only a portion of them have organized separate boards of health. So far as we know the results of the administration of town boards of health over the sanitary affairs of the smaller villages is satisfactory, wherever the town and village authorities have agreed so to treat the public health and registry duties. There are a few instances in which the village area is coterminous with that of the town; and there are numerous others in which two or three more towns are in part comprised in an incorporated village. In the latter instances the maintenance of the village organization for certain branches of the local government, and for those of the public health and registry especially, is very important. Wherever the proper sanitary preparation of a village site, the adoption of drainage and sewerage works, the introduction of a public water-supply, and the maintenance of systematic sanitary inspection are provided for in a village, the necessity for its own separate board of health is obvious. The amended law, before mentioned, has made special provision for the separateness of village and town accounts in respect of all expenses of sanitary works and official services that should be chargeable only to the incorporated village, on the one hand, or to the township on the other. In numerous instances the duties in which the State Board gave its aid and advice for the repression of diphtheria, small-pox and certain causes of danger in villages, the corporate limits of the village extend into several contiguous towns, so that whatever is effectively done must be at the cost and by the authority of the corporation and under direction of the village board of health. On the other hand there are recent instances of necessity for the prompt joint action and mutual agreement of the town with the village authorities, as witnessed in the town of Queensbury and its contained village of Glens Falls, where the suppression of small-pox could not be effected without such co-ordinate action, as numerous families along the corporate limits and beyond them were already smitten with the contagion, the danger was common to all, and

the lazarets for the sick had to be located in a sequestered field, a mile or two beyond the village. The seventh section of the amended general health law has proved entirely satisfactory in these varied exigencies.

Towns.—In each of the 947 townships of the State the amended law provides that there shall be a board of health constantly maintained. The distribution of upwards of 2,000,000 of inhabitants in these towns may vary even more widely than at present; and yet the necessity for having all suitable records kept, all facilities of official communication at hand, and all the means of protecting health and life as freely afforded to the inhabitants of remote towns, as to those which are near, when the State offers advice and assistance, is obvious. The laws now provide for and require this. The fact appears again and again, in the body of evidence herewith submitted in the appended reports, that remote, sparsely populated, and the least affluent communities in the State have frequently needed and sought the aid of this Board and that they have promptly and effectively organized and begun their town board of health duties. The 11,400 common school districts in the townships have served as the ultimate units of the civil organization in our State, and under the provisions of the Laws of 1880, this Board has derived great advantages from the privilege of communicating directly with the school district officers who are ever informed and cognizant of the events which need to be made known alike to this Board and to the town authorities. The ultimate extension of sanitary observation to and within the school districts and the remotest habitations in the commonwealth, the inducing of a responsible concern for human life and health and the registry of the three signal epochs of life in every family, and, if possible, to so exercise the authority and influence which the laws have entrusted to this Board, that the families, neighborhoods, towns, villages and cities in New York shall carefully do their respective parts in guarding against preventable harm to health and life, is the supreme endeavor of this new department of State service.

This distribution of the civil organizations and distinct kinds of local government of the population in the State will ever preclude the operation of a centralized assumption of the details of execution of sanitary laws and regulations; for, upward of twelve hundred local government organizations, namely, the towns and villages, are to be ever held responsible for the public health and the vital registry within their jurisdiction, respectively. The State Board is beginning to find it practicable to co-ordinate and connect all these into a State system.

LOCAL BOARDS OF HEALTH.

At the time when the Board was organized in the summer of 1880, the twenty-four cities, and perhaps twenty of the townships and twice as many of the villages, had some form of sanitary government. The general public health law of 1850, which had been called into existence by the terrible events of cholera in the previous year, was everywhere available as a basis for correct sanitary organization to meet such exigencies as the introduction of cholera and other pestilential diseases might render necessary in the incorporated villages (the number of which is steadily increasing, having only in a few instances availed themselves of the general provision made in the law for the organization of villages in 1870; and some of the older villages, incorporated under special charters, had for a board of health, whenever it might please the village trustees, the board of trustees itself. Few, if any, of the local boards in villages or in towns evinced any activity, or had any special preference for a particular method of sanitary organization. In cities and villages alike, with rare exceptions, the chief health officers held their places rather as a matter of favor than of fitness. New York, Brooklyn, Rochester, Buffalo, Elmira, Poughkeepsie, Newburgh and Yonkers were, in some worthy degree, exceptions to this general condition. It was early ascertained that in all parts of the State the more enlightened and public-spirited citizens expressed a desire for decided improvement in this sanitary service of the people, in townships as well as in villages.

The amendment of the general public health law of 1850, and all subsequent acts amendatory of it, were so obviously necessary that the last Legislature enacted a certain amendment which is known as chapter 431 (Laws of 1881). Though that amendment may not prove to be entirely adequate to meet all requirements in the interests of public health — it certainly has produced excellent results thus far. Its chief advantage consists in enabling a town, village or city to organize its board of health upon a basis of competency and power to become efficient, and yet to be required to maintain a strict accountability and economy in all its affairs. It provides that the State Board of Health shall call into organized activity any town board of health, and that such board must maintain the laws relating to the complete and perfect registration of deaths, births and marriages, and also be ever in readiness to repress and provide for contagious and infectious diseases and other causes of danger to the public health.

It is believed that the amended law will work no hardship to any one, and that it has already proved more economical and directly effective in its operation, by far, than the provisions of law which it amended.

The township, the city and the incorporated village have from the beginning of the State's history constituted the units of local government, and they are endowed with a large authority to do those things which are necessary for the special welfare of the community. The traditional and historical importance of these primary civil divisions and local governments seem to make it quite suitable to trust largely to them in the administration of public health laws. Numerous statutes relating to public health, all alike recognize the obligation of the town, village and city to provide well for the protection of life and health, and also for the registration of the vital records within their respective local jurisdictions. Yet in making the law of 1847 (chapter 152) and the law of 1880 (chapter 512), relating to registration, there is such recognition of the competency and duty of county boards of supervisors to provide, or to regulate the rate of compensation, etc., for this registry service, that it has become a delicate yet very necessary duty to modify the operation of these two statutes to such an extent as to make each local board of health responsible for the completeness and efficiency of this duty relating to the vital registry, which, as now construed in all counties, is closely allied to the necessary sources of information and duty of local sanitary authorities. Under chapter 431 of 1881, this part of the duty of local boards of health has begun to be provided for, but whether this law supplies all the ways and means that are necessary for securing perfect results remains to be seen. Thus far it works well, and certainly works no hardship, though it imposes onerous duties on some of the boards of health.

Town boards of health.—The town board, as organized under chapter 431, proves to be, thus far, without any exception known to us, working economically and successfully. Nothing, perhaps, can exceed the simplicity, and probable certainty of harmonious and effective organizing and maintenance of the duties of the town board of health. A description of what occurs on a call from the State Board of Health to the supervisor of the town to organize the local board of health is detailed in a few words:

First. The supervisor, at the request of the State Board of Health, or of his own motion, or that of other citizens, convenes the justices of the peace and the town clerk; they at once proceed to elect a member, especially to counsel and aid in their work. These together constitute the town board of health. They must elect a competent physician to be health officer.

Second. The regulations and orders which the board would promulgate are duly adopted and published or publicly posted.

Third. The board, by regulations and rules which it adopts, is required by law to make the registry of deaths, births and marriages

complete and perfect, and to adopt and maintain such regulations as are necessary for the proper sanitary care, removal and burial of the dead.

Fourth. The board is required to promptly recognize the presence of, and provide for, the isolation and sanitary control of small-pox, diphtheria and other contagious pests; and in doing this to report to the State Board of Health, and to seek whatever counsel and information may be needed to meet emergencies. In the report of one of the standing committees here appended, a few illustrations appear in connection with current statements of procedures for the suppression of dangers to public health in remote townships.

It is believed that in every one of the nine hundred and forty-seven townships the local board of health provided by law should be organized and kept in a condition of constant efficiency, and that no county board of supervisors should delay to authorize the few needed provisions for maintaining the duties which relate to the registration which the law now directs every town board of health to supervise and make complete.

Village boards of health.—Each incorporated village in the State may claim its right to organize and maintain its separate board of health. Many such boards have been already organized within the last six months, and in some instances the village is by mutual agreement, or under the supreme necessity of the occasion, united with the town board in most important duties of their respective jurisdictions. A conspicuous illustration of this is presented in the history of action taken in suppressing small-pox at Queensbury and Glens Falls. Attention is invited to this instance which is fully narrated in an appended report. The town board of health thus accepting and promptly meeting imperative responsibilities in the presence of spreading pestilence, as in Queensbury, proves the value of the traditional duty and powers of the town to guard its entire population when all are in danger, and to stand in the breach for the welfare of the commonwealth. Perhaps no better example than that given in the town of Queensbury has ever been witnessed. Its chief village was infected in numerous streets, and the country endangered far and wide. The town board of health organized, made the village health officer its own, constructed and outfitted hospital huts in a night, and assumed the cost.

Village boards of health find before them at the very first of their service, under whatever law they may be created, that certain most essential duties demand their attention. The chief of these relate to adequate sanitary preparation and improvement of the village site by systematic drainage, the adoption of suitable methods for the disposal of excremental and other outflowings and waste matters, especially as

regards house-drainage and the common sewerage, the provision and protection of pure water supplies and the regulation of such sources of nuisance as the laws enable the village boards of health to control or prevent.

It so often occurs that the-village site is, from the first, insalubrious and topographically unfavorable, as respects drainage, or by an environment of swamps, ponds and neglected grounds and by the pollution of the common water-supplies, that some general sanitary improvements have to be ordered by the village government. Not unfrequently are these sanitary requirements of such a nature that it is necessary to seek to extend the drainage works and other improvements to a considerable distance beyond the corporate limits. In one instance which was early brought to the attention of the State Board, nearly one-third of all the inhabitants of a large incorporated village was found suffering from a malarial fever which was ascertained to arise from stagnant pools and sodden grounds a little distance beyond the corporate village limits.

The general provision for investigation and action under orders by the Governor as defined by sections 8, 10 and 11 of the organic law of this Board appears to be quite necessary wherever demanded for such cases. In certain instances of such investigation by order of the Governor, the evils complained of have been in two and even three or four contiguous towns, at and near the central village, and, in some instances, the complaints and requirements for sanitary action extended into adjacent counties.

City boards of health.— With scarcely an exception, the city charters and their successive amendments have devised various modifications for the organization and working of the municipal board of health. The general health law of 1850, having provided that the mayor and common council may and do constitute the board of health, that law became the common basis of most of the city health boards; but it was early found, and has been often illustrated, that the identity of the municipal legislative board with its health board, offers not only temptation and facilities for mal-administration, and costs which are wrong; but that expertness and efficiency in the sanitary service are rarely obtained under such circumstances. It was for this reason that the Legislature in 1881 provided that it should be the duty of the common council of every city in the State (except in a few instances), to appoint a board of health to consist of six persons who are not members of said council, and that the mayor shall be a member *ex officio* and also be president of the board. Of the six members so appointed (and "one of whom shall be a competent physician") two are appointed annually after the first board is filled. Whatever may be

the action of any one of the cities which may need to improve the sanitary service, the law here mentioned is sufficiently good and practicable to be worthy of adoption.

As upwards of half of the entire population of the State dwells in the cities, and is necessarily exposed to the innumerable causes of diseases which breed in filth and foul air, and especially to infectious fevers which are ever present in the larger of these cities, if not in all of them, it is a matter of the utmost importance, not only to the cities themselves, but to the entire State, that the best possible care of health and life should be provided for in every city. The terrible neglect and waste of health and of human life in the metropolis of the State, became a historical fact, and so aroused the concern of the people in all parts of the State, that the Legislature, in 1866, enacted that remarkable law which has become the basis of one of the best sanitary codes in the world; we refer to the Metropolitan Health Act, and the code that is based upon it. The question now is, how shall every city in the State secure as 'good, or even better, sanitary government? The State Board of Health feels in duty bound to advise that wherever it is practicable, under existing charters in this State, the local boards of health shall be organized in accordance with the provisions of section 1 of chapter 431, Laws of 1881.

THE NEW SANITARY LAWS, CHAPTERS 407 AND 431 OF 1881.

Chapter 431 of the Laws of 1881, designed to facilitate and strengthen the service of local boards of health has been referred to in the preceding pages, with examples of its operations. More examples of the same kind will be mentioned in the appended reports. If this law need still further amendment it will be with reference to clearer definitions of health officers, the simplification and better arrangement of the general laws with which it stands related; and, probably, with reference to a carefully guarded power to be conferred alike upon the State Board and all local boards to give effect to the obligatory duties of professional persons and householders to furnish the certified records required for the registry of vital statistics. The outline of a brief amendatory act will be submitted to the Legislature for the attainment of these most important objects.

Chapter 407 of the last session laws has laid upon this Board the duty of conducting all investigations required by its provisions for preventing the adulteration of food and drugs.

The law defines adulteration and declares it to be a misdemeanor. It provides for a system of inquiry by inspection, examinations and analysis of all articles used as food or medicine under such rules as the Board prescribes. The results of the investigations thus far made have

demonstrated the necessity of this act. It is fully approved by the Board, and no delay has been made in organizing the bureau of chemical analysis of food and drugs as the Legislature directed. Eight chemists and three inspectors were thus assigned to their respective tasks under definite instructions, within specified limits and rules that enable each one of the whole number thus employed to go on with his work without encroachment upon any of the others.

The report of the standing committee to which this branch of duty was committed presents a series of papers in a separate report. The object of the initiatory investigations was to ascertain the nature and extent of the various adulterations found in articles sold within the State, and to determine the best methods for detecting them under the law; also to secure the necessary data by which to fix the standards of purity. An elaborate report of this work is hereto appended.

REPORTS OF COMMITTEES.

The executive and finance committee reports that the total expenditures of the Board during the fiscal year ending September 30 amounted to \$10,305.51, and that the total during the entire history of the Board, sixteen months to that date, was \$13,906.08. There was at that date a balance in the State treasury to the credit of the Board from the first appropriation of \$1,093.92, or more than sufficient to meet all accounts then due.

Estimates for all anticipated requirements of the Board for the year beginning October 1, 1882, have been approved and sent to the Comptroller.

The sanitary committee's work comprises the separate papers relating to the work under the food and drug law; also a special report upon water analysis and the sources of defilement of drinking water, and an extended report of original investigation upon methods and apparatus for a safety test to prevent dangers from illuminating oils.

The committee on registration and vital statistics presents its report relating to registration, together with a series of local reports on prevalent diseases.

The committee on sanitary legislation has reported upon State and national laws for preventing the spread of contagious diseases by immigrants, and upon rules and regulations of local boards of health.

The committee on quarantine has reported on the experience and results of the New York State quarantine establishment.

The committee on public institutions submits an important report on the results thus far attained in the sanitary inspection of school-houses. This report is supplemented by a special report by Dr. Lincoln, an expert engaged in this branch of the Board's work.

The committee on Drainage, Sewerage and Topography submits a series of statements showing certain plans and results of work under its supervision and advice during the year. This report is supplemented by two special reports by an expert engineer and topographer, who has been engaged, from time to time, upon the sanitary problems of the abandoned canals and of the great swamp areas of the Tonawanda and the Oak Orchard Creek basins. The chairman of the committee has presented an important statement concerning the drainage and the disposal of excremental and other waste matters in villages and populous towns of England.

STENCH NUISANCES.

The petition of many citizens of the metropolis, indorsed by the Governor's instructions to this Board, in January, 1881, led to a more protracted and difficult investigation and entailed greater tasks than had before been undertaken, and as the entire proceedings have been based upon the correctness and justice of the claim made by the inhabitants of the central and most elevated wards in the city of New York, to the effect that the people are entitled to the protection of the common atmosphere against the defilement of it by stench and nauseous or irritating vapors and gases, this cardinal doctrine of sanitary protection was, from first to last, so important and far reaching that no temporizing, compromise or postponement could be justified in conducting this investigation and applying its logical results. The report and papers now submitted by the special committee to whom this matter was referred for investigation, etc., show that while the evils they confronted have been found amenable to sanitary treatment or removal, the principle involved in thus organizing a deliberate warfare against them will prove so comprehensive in its operation that other cities than our metropolis, and even any city or place of popular resort, may claim protection as justly as the affluent residents of Murray Hill and the dense population of tenements of the East river-side regions opposite and in close proximity to Hunter's Point and Newtown creek.

The details of experience in the Board's dealing with the stench-nuisance problems, as presented in various places the past season, need not here be given; suffice it to say that precisely the same advice and the same kind of exact information have proved effectual as well as equitable in dealing with offensive effluvia from stench-producing trades and materials in populous villages and near great summer resorts. The committee reported that "not less than nine-tenths of all effluvia nuisances and matters of complaint by those who have given testimony on the subject, and as far as witnessed and investigated by

this committee, can be wholly controlled and prevented by simple and entirely practicable means, the working of which the committee has carefully examined and proved to be now in operation." And this Board has adopted the conclusion "that whatever means and regulations have thus, or shall otherwise have, been found to be good and sufficient, should be made a matter of obligation and necessity; likewise, whatever cannot be sufficiently controlled by available means for the prevention of such nuisances within the cities, or other immediate populous neighborhoods, should be removed to a reasonable and proper distance from the populous districts, and whenever any of these establishments are found they should, as a matter of course, be under suitable sanitary and police regulations established by local or general laws."

Whether enacted as a law, or left to the ultimate conclusion and recommendations of this Board and the executive orders and instructions thereupon, the plain principles and procedures here mentioned can be judiciously applied without hardship to any legitimate business that would be brought under such direction. State interference is not to be invoked in any such affairs until local authority hesitates, fails, or is found to be unsuited to grapple with the evils complained of. The Board finds that its conclusions and its advice in regard to the effluvium nuisances as subjects of sanitary interference are quite in accord with the conclusions which the expert commission under the Local Government Board of England has submitted to that board after years of skillful inspection and research.

PROCEDURES UNDER THE EIGHTH SECTION OF THE STATE BOARD OF HEALTH ACT.

Of the several cases which the Governor has referred to this Board, requiring it "to examine into nuisances or questions affecting the security of life and health," only the miasmatic nuisance connected with certain portions of the late Genesee Valley canal—now the property of a railway corporation—and the stench nuisances at Hunter's Point and upon Newtown creek have, during the present year, proved so general in their relations to numerous communities at once, and so unmanageable as regards any one board of health, that the executive interference, as defined in this section, has proved to be necessary. The reports of the special committee on the stench nuisances in the vicinity of Hunter's Point, and the papers relating to the abandoned canal nuisances, as herewith submitted, will be examined with interest by all who are concerned in overcoming great nuisances that extend their pernicious effects far beyond the local jurisdiction of any one board of health.

The nature of the evidence on which the conclusions of this Board were based, the mode of applying and enforcing the executive orders, and the spirit and methods of compliance in the instances here mentioned, may be regarded as marking the introduction and acceptance of an equitable and comprehensive policy in procuring the abatement and permanent prevention of great evils that are not amenable to local authorities within their limited jurisdiction. In the sanitary care of the abandoned canal prism between Scottsville and West Sparta a railway corporation is the responsible holder of the property, while parts of five or six towns and of two counties are suffering from the artificial swamps and stagnant pools of the abandoned canal-bottom. By accepting the order and instructions from the Governor, to execute the drainage works recommended by the State Board of Health, the corporate holders of the property thus prevent the delays and costs of local litigation, while the people of that region secure all the protection the State can offer. The last Legislature recognized the duty of responding to the Executive recommendation for removing the miasmatic nuisances that were complained of along various sections of the abandoned canals not yet released to estate owners. The same principle has governed in these two cases respectively. The Governor requested the State to abate the dangerous nuisances which menaced the health of a great number of families that were helpless in their exposure to the miasmatic bottom or prism of the canal, which had become a system of artificial swamps.

In the procedure, under Executive instructions to ascertain the sources and nature of the stench nuisances in the Hunter's Point and Newtown Creek regions, the extent and complexity of the causes, the great number of persons and corporate bodies responsibly concerned in them, and the necessity for obvious impartiality in the orders and action for suppressing and preventing the evils discovered and reported, the Governor's preliminary notice or proclamation, as issued April 22d, seems to have been well adapted to its object. The enormous assemblage of stench-producing businesses, offensive trades and trades offensively conducted, yet most of them truly legitimate industries, to be thus brought under sanitary control, or to be closed and suppressed for the sake of the vast population which complained, has imposed a task requiring much prudence, patience and careful investigation.

The report of the Special Committee to whom this task was committed by the Board shows that the eighth section of chapter 322, of 1880, is producing more comprehensive results than were at first anticipated. It is now apparent that it is possible so to apply and give

effect to this section of the law that the persons, corporations and invested capital which are responsible for evils which many share in causing, and which thousands of people share in suffering, shall become enlisted in controlling and suppressing them. The twelve petroleum refining corporations, while daily refining upward of 1,200,000 gallons and producing in that process upward of forty-five tons of sludge or spent-acid, adopted the necessary means for controlling and preventing all their causes of nuisance, and in their written guaranty they "do promise and agree that hereafter the said refiners and each of them will prevent the open exposure of spent-acid, the product of refineries, at any place within fifteen miles of any city in the State of New York during the warm season, and eight miles from any such city during the cold season; and that neither said spent acid nor any other offensive material, shall be permitted to flow, leak or waste into or upon the ground or streams, * * * and that whatever * * * shall be used at or by said refineries as fuel shall be so perfectly consumed that thereby no hurtful or offensive smoke or stenches shall be produced. * * * " This engagement has been adhered to with the utmost fidelity. The Board places this testimony on record to illustrate a method of enlisting the best resources of great industries in procuring compliance with sanitary laws and regulations.

The director of the most extensive of the superphosphate fertilizer factories, whose premises in Queens county were near the Murray Hill district of New York, wrote, after receiving the Governor's orders, "we concur entirely with your committee, that 'whatever cannot be controlled by available means should be removed to a reasonable and proper distance from the populous district.'" The adoption of this view of public and personal duty, as regards widely spread stench nuisances, has at last procured the removal of not only the worst source of effluvia nuisance that failed to be controlled, but it has come to be accepted as a correct basis for law to repress and prevent such evils. None can dispute the claim that all people are entitled to pure air; and this is what the protracted inquiry and difficult task of this Board in the stench-producing region of Hunter's Point has signified. It is creditable to the managers of the vast industries which caused offenses that the final instructions by the Governor have been so intelligently and heartily responded to. Although the task of controlling and cleansing is not yet completed, the eighth section of the organic law of the Board is producing good results, and it works no serious hardship to any legitimate trade or business. It is found adapted to secure the abatement and prevention of great evils that have obstinately resisted local authorities. The "Three counties act" (chap. 415 of 1851) applied only to New York, Queens and Westchester counties, and it

has presented so many difficulties, even in the simplest cases brought before the courts in those counties, and is attended by so much cost and vexation to individuals who bring action, that it has remained practically a dead letter, excepting in one or two instances.

The Executive instructions and summary orders which the eighth section of the State Board act provided for, tend to prevent litigation, and to secure genuine respect for sanitary conclusions and orders. The fact that parties who are pecuniarily interested in the perpetuation of an evil, may embarrass the proceedings for compliance with the Governor's orders and instructions, by obtaining injunctions, or setting up counter-actions against the party whose duty it is to comply, may not in general diminish the practical value of this law.

LAWS AND SANITARY PROVISIONS RELATING TO SMALL-POX AND VACCINATION.

As it is a traditional law of the human family that, as regards the small-pox contagion, "the public safety is supreme law," there is no exception to the universal, arbitrary and often rude application of this instinctive rule of self-preservation. Repulsive, terrifying and destructive as small-pox is, there still prevails a kind of reckless fatalism which stupidly waits for the introduction of the deadly contagion before the one great means for prevention is resorted to. Local health boards report that the people wait for a *panic* from this disease before they will seek protection by *vaccination*.

The experience of the State Board, however, during the past year goes to show that by providing certain essential aids to physicians and the local boards of health, and supporting their efforts to secure the proper vaccination of all who are unprotected from small-pox, the indifference and objections to the protecting service of the vaccinator give way to a thankful appreciation of it.

The kind of *aid and support* required, will need to offer *information, plans, occasional guarantees for payment of vaccinal supplies*, or, perhaps supply the *pure virus gratuitously*, and at all times to make the State Board a centre of information, advice and action *for the perpetual suppression of small-pox*.

The Committee on Vital Statistics has submitted a statement that shows the Board has succeeded in laying a basis for the system here defined. It may be necessary to have the duty and authority of this Board more completely affirmed in the laws relating to this matter. The vaccination law of 1880 (chapter 438) was for the first put in action by advice issued to every town and school district last spring. That law is limited, in its operation to common schools. It is neces-

sary to reach every householder with the language of an *obligatory law and regulation* concerning vaccination, and at the same time to offer within proper limitations, the guaranties of pure vaccinal virus, and of gratuitous supplies of it for the poor and to meet sudden exigencies of local boards of health. Some details on this subject appear on a subsequent page. The terrible enemy to be disarmed and destroyed by sanitary organization and vaccination will stalk up and down through all communities that do not thus organize and act efficiently, and it should be remembered that until vaccination was discovered, the whole civilized world was in mortal dread, for as the great historian Macaulay, said of England, "small-pox was always present filling the churchyard with corpses and leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered and making the eyes and cheeks of the maiden objects of horror." Against an enemy and destroyer so dreaded no sane citizen should deny the right and duty of applying such obligatory laws as are necessary for the complete protection of the people.

IMPURE WATER SUPPLIES; POLLUTION OF WELLS AND STREAMS; WATER ANALYSIS.

The filth-soakage, which is known as a cause of fatal disease wherever it occurs in connection with wells or other sources of domestic water supply, is found to have all the importance that was attached to it in the Board's first report. House epidemics of diarrhoeal disease, and the typhoid fevers as reported to this Board seem to have resulted chiefly from this one filthy cause.

The pollution of streams as well as of grounds that surround the nearer sources of domestic supplies of water has been carefully investigated in numerous places. The appended report upon chemical analysis of water-supplies unfolds the fact that in some instances the most positive defilement and unfitness of water was not revealed and explained so much by quantitative chemical analysis, as by the actual suffering of those who drank the polluted water, or by odors and minute kinds of proof of impurity. There is reason to suggest that there should be adequate resources of law at the command of sanitary authorities to prevent the pollution of streams, ponds and grounds about wells and springs, used for domestic or potable water-supply. Evidence of the necessity for definite legislation to prevent this cause of danger to public health is being arranged at the central office of this Board, while advice and the chemical analysis of suspected waters are offered to all local authorities who need such aid.

In a report from Engineer Egerton, which will be found appended

in the papers on Sanitary Drainage and Topography, it is shown that the soakage from a butchery and swine-herd on the margin of the reservoir of a private water company, which is supplied from the Mohawk river, was an obvious source of impurity. The chemical analysis which was made of that reservoir water by Prof. Waller found only a small percentage of organic impurities; yet when heated to 100° Fahr. the water gave off offensive odors characteristic of the animal filth that defiled it. In like manner it appeared in the analysis of the water that killed nearly an entire family west of Ithaca last year, that the excremental pollution of the family well had more importance than any thing that was revealed in the chemical laboratories in which the water was carefully analyzed.

This board while offering to every local board of health the resources of the best chemical laboratories for water-analysis, has no hesitation in advising that purity of source and surroundings of the water-supply for domestic use must be regarded as paramount to any thing that chemistry may be expected to reveal; and that in addition to being pure, the supply of such wholesome water should be in a sufficient quantity, and its source be carefully guarded against all causes of defilement.

THE GENERAL DRAINAGE LAWS.

As laws relating to drainage are co-incident with the history of civilized States and their legislation, New York has shared with other States the promiscuous kinds of law-making on this subject from almost the beginning of its organization as a Commonwealth; but in 1869, an act amendatory of the Revised Statutes relating to general drainage was adopted, with an obvious intention to secure the systematic drainage which certain portions of the State greatly need, and which each of those populous regions, namely, Seneca, Northern Cayuga, Onondaga, Wayne and portions of Monroe, Orleans, Niagara and Genesee counties, alike called for at that period. Portions of Orange, Richmond, Queens, Westchester and various other districts in the State required, and still require, the operation of such a comprehensive and equitable general drainage law as shall be adapted to remove the general obstructions to the outflow from swamps and marsh-lands, to secure thorough drainage for health as well as for wealth.

Such, undoubtedly, was the object in view by those who prepared and enacted the General Drainage Law of 1869 (chapter 888), and its amendments in subsequent years.

In the practical operation of the law, and its amendments, grave difficulties and obstructions have arisen, which the legislature will need, sooner or later, to provide against.

The fact that swamps, marshes, stagnant and fluctuating ponds, foul streams and wet lands, have an important causative relation to miasmatic diseases, and to certain maladies that are still more fatal, is admitted to be so true that in the interpretation of the General Drainage Law of 1869, the courts have held that unless the proposed drainage is necessary for the public health, the County Court does not acquire jurisdiction for the enforcement of that law. The condition under which the initial proceedings for drainage are taken under it, is, that "any person or persons who shall deem it necessary for the *public health* that any such swamp, bog, meadow, or other low or wet land shall be drained, may present a petition, duly verified, to the county judge, etc., etc." Though public economy and private advantage might justify an obligatory general law for drainage, the interests of public health are first in order, and they really are paramount.

Faulty as this law now is, certain miasmatic districts have been greatly improved by its application, yet as mentioned in this Board's report a year ago, the drainage laws of the State are practically inoperative and have been the occasion for abuses which the legislature did not foresee. For this and various other reasons which will appear in the presentation of the special report, herewith submitted, — showing what are the essential requirements in a general drainage act, — the board now earnestly invites the attention of the Governor and legislature to the existing necessity for such a general statute as shall adequately provide, 1st. For thoroughness and efficiency in the service and plans that relate to the drainage of extensive areas of swamp and wet lands, in regard to which the State has a responsible concern, especially through all those districts in which the canal-feeders and their storage-lakes and ponds are situated.

2d. That every county, town, village and city shall be authorized and enabled by statutory provisions, to devise and proceed with such general drainage, as the judgment of local Boards of Health in the districts concerned, confirmed by the State Board of Health, shall advise. And that the plans for such drainage, whenever they extend beyond the limits of an incorporated village, township, or city, shall be approved by the State Engineer and the State Board of Health.

Perhaps it is not practicable for any State authority to interfere with the preference of tax-paying citizens for the purpose of obtaining for them the sanitary drainage necessary for the protection of health and life in their families, yet there have been brought to the attention of this Board certain instances of great public necessity for sanitary drainage which ought not to be delayed for another year; but in certain communities that are so unsettled in their local judgments and action, whole neighborhoods would take the chance of sickness half

the year round, and a considerable addition to their mortality, before any united action and taxation would be undertaken by them for deliverance from miasmatic diseases. The citizens of Memphis, Tenn., lived, and thousands of them died, in this dangerous way, until annihilation, or action, became inevitable alternatives. This Board makes it a special duty to enlighten and counsel the communities in order that they may act earnestly and intelligently.

Every local Board of Health is likely to have occasion both to recommend, and require, certain kinds of local drainage, the removal of obstruction to streams, and the drainage and filling of pools and sodden grounds. To accomplish these minor works of drainage promptly and properly, the general drainage act may well confer upon local Boards of Health adequate power to cause the proper execution of such sanitary works. The great evils which have arisen from the exercise of that authority in the Drainage Act of 1869 and its various amendments, by which the towns and counties in which the drainage is to be executed shall issue bonds or certificates of indebtedness to secure the performance of the work, has led to such grave evils, that a better way must be devised to encourage, and enable, the people to protect themselves against the harm of swamps and malarial grounds. It may be worth the attention of legislators and publicists, to notice the beneficent operation of the English Local Government laws, under which the State itself offers to loan, on easy terms, a certain per centum of the total sum that is found necessary by any local government, or parish, or other civil division, for sanitary administration, for the completion of such drainage and other improvements as the local authorities decide to undertake. The laws here referred to have been in operation now for nearly ten years with the most encouraging results. The loans, though moderate, have produced remarkable advancement in the public welfare of hundreds of places. The financial obligations thus incurred are promptly and thankfully honored, and this system has put an end to all speculative methods of bonding and town indebtedness at the discounts of the brokers' market. It is unnecessary in this place to make specific recommendations as to what should be done, but it is so important in this State that a General Drainage Act should be well framed, and if possible, should become a law before another summer, that this Board's committee on Drainage, Sewerage and Topography will respond to any call of committees of the Legislature that take this subject in hand.

Though there is a vast extent of swampy and other miasmatic areas in the State of New York, it is chiefly important at present, and for several years to come, that such sources of malarial and other diseases, which drainage and the drying of grounds alone can overcome, should

be removed as promptly and thoroughly as practicable from the midst of, and near the vicinity of the more populous and much frequented districts; for at present we judge that fully one-half of the entire population of the state is dwelling in the immediate presence of such sources of malaria, as may, and should be removed by the adoption of general and local measures of drainage of those districts, and local sanitary improvement of the dwelling-grounds and the site of hamlets and villages.

In numerous places the drainage works that will be found necessary for removing the sources of *miasmata* in a village or populous neighborhood cannot be successfully or economically executed without extending in such directions and to such distances as to remove the local causes of malaria from the entire series of villages and hamlets. In the counties of Richmond, Orange, Albany, Wayne and Genesee this fact is obvious.

The natural drainage-areas when treated for sanitary purposes, require the engineering and scientific knowledge which the State now permits this Board to employ under a provision of the law defining its duties. In responding to numerous requests from local authorities, especially in the cases that have been referred by the Governor to this Board, it has come to pass, that in the first steps toward the real and permanent prevention of evils complained of in regard to malarial and other diseases, it has been necessary to employ such engineering and other scientific aids as should secure the best results with the least expenditure. Certain records of procedures thus taken are submitted herewith. The two reports upon the drainage in the Genesee and Canaseraga valley, and the one relating to systematic drainage required in the regions near Batavia and Tonawanda, or the drainage areas of the Oak-orchard and Tonawanda creeks, supply some illustrations of the necessity for a comprehensive treatment of general drainage questions. The special reports relating to strictly local drainage, such as was found to be necessary in the vicinity of Oscawana island, the city of Hudson and the village of Croton Falls, as also in the region of Southfield, reported upon by Dr. Carroll, show what may be correctly and effectively done to remove local causes of miasmatic diseases by local authorities and the owners of estates.

This Board earnestly commends to your attention, and to the attention of the legislature, the importance of perfecting the statutes relating to general drainage, and at the same time clearly defining the duties and authority of local boards of health in regard to such systematic or special drainage as should be executed by them, independently, within their separate jurisdictions.

Sanitary Drainage of Villages and the Treatment of Drainage-areas in Populous Districts.—Disposal of Domestic Waste Matters.

Most villages are so located with regard to streams and ponds of water and their natural drainage or water-shed, that a systematic treatment of the outflowing from each factory, stable and street, is an obvious sanitary necessity; yet until the present time only a few of our villages have given heed to this matter in such manner as suitably to protect the public health.

The disposal of domestic waste material and of all excremental matter is of the same sanitary importance in villages as in cities. Indeed, it is of like importance in and about every dwelling. The family-well, the stable, the pig-stye, the cess-pool and the privy, have hitherto been grouped and located about the cottage and mansion, with strange disregard for natural laws of health and purity, as shown in this Board's former report. Fatal fevers, blood poisoning and bowel diseases in villages of greatest natural salubrity, may be readily traced to this vicious saturation and filthy soakage of excremental and foul matters about the dwelling. To avoid and effectually prevent this class of evils, in villages especially, it is necessary that, under local sanitary orders and regulations, there shall be systematic and faithfully enforced provisions for drainage and a safe mode of disposing of all excremental matters. Without entering at large upon this subject the Board would here bear testimony to the imperative necessity for systematic drainage and suitable sewage-delivery to protect the public health in every village.

The examination of numerous villages, and some of the smaller cities, by this Board during the past year, confirms the judgment here expressed that, in every village and hamlet, as well as in every city, the entire drainage area within its jurisdiction and even beyond such jurisdiction, the *natural drainage areas*, should be surveyed and treated as the fundamental part of a sanitary system necessary to the protection of life and health in such populous communities; for unless this foundation is laid, upon which the purity of dwelling sites and wells and of the atmosphere shall depend, then no affluence of the dwelling, no superior intelligence in the family, and no degree of anxious care of parents and of house-holders can secure the protection, which every domicile and individual—even the humblest—ought to enjoy. The Board takes pleasure in presenting a statement hereto appended by the chairman of its standing committee on drainage, sewerage and topography, who undertook during a visit in Europe the past summer, to examine into the practical results of drainage and disposal of waste and excremental matters in villages and small towns.

PUBLIC OBSTRUCTIONS TO NATURAL DRAINAGE—SANITARY QUESTIONS CONNECTED WITH THE ABANDONED CANALS AND THE MALARIAL POOLS AND GROUNDS NEAR THE ERIE CANAL.

This Board has had its attention called to no less than fifteen instances of obstructions to natural water courses, caused chiefly by railroad embankments. The right of "eminent domain" is everywhere regarded as carrying with it the corresponding obligation to prevent the use of that right and the franchises acquired under it, from being a source of injury to health and life. Some details which illustrate this subject are given in statements here appended concerning miasmatic nuisances that have been complained of to this Board, and by it brought under investigation. It is believed that in the instances here referred to and perhaps, generally, the railroad corporations will satisfactorily respond to the requirements of local sanitary authorities and to any recommendations of this Board which the Governor may order to be complied with. Special obstructions that were created in the course of construction of the Erie canal, and especially of the numerous "feeders" have been brought to the attention of this Board. Several of them have been examined and at present it appears to be true that the entire system of "feeders" and the canal itself, may readily be made to facilitate and protect the sanitary drainage of the immense stretch of the country through which this water-carriage system extends. Though it does not do this at present and in all places, it should be made to do so. It is worthy of remark, in this place, that medical and sanitary observations along the entire course of the Champlain, or Northern canal, from Troy to Lake Champlain, and along the late Chemung canal, especially in the Catharine Creek valley, where drainage works of the abandoned prism have just been completed, show that the miasmatic diseases of those regions were not only greatly diminished, but had nearly if not wholly disappeared for many years following the completion of those canals. The canals need not and must not become sources of disease.

A peculiar and unthought of cause of obstruction and of great nuisance and danger, has occurred along the course of the western terminus of the Erie canal. Beginning at the Hamburg street *cul de sac* at the western terminus of the great canal, the total sewage of Buffalo and of all other places that can pour their filth into the canal, along the entire distance through Erie and Niagara counties, has at last so polluted and obstructed the canal as to convert it into an elongated cess-pool and stench nuisance, all the way from Buffalo to and beyond Lockport, a distance of thirty miles, and upward; while Buffalo, Black

Rock and the two villages of Tonawanda are already suffering a penalty—that of nauseating sickness, and an increased mortality—in consequence of this prodigious nuisance, all who live near the canal and even the entire city of Lockport, miles away from what is known as the Hamburg street canal nuisance, are suffering all summer and even until the frosty season, from an evil they cannot avert. It is justly demanded by the people of that region that the State shall forbid and prevent the obstruction and pollution of this great artificial water-way. There is reason to believe that the city of Buffalo will be constrained to put an end to this evil in sheer self-defense. This Board carefully investigated the facts here referred to in the summer of 1880, and fully coincided in the conclusions of the expert engineers, whom that city had called in counsel with it.

There have been frequent occasions for this Board's advice concerning obstructions, misuse, and defilement of certain unused "feeders" and "basins," and other stagnant reservoirs and ponds and streams of water, contiguous to the Erie canal, and the facts thus far observed will warrant the suggestion, which the Board would here respectfully make, that by means of a moderate appropriation, and suitable amendments of law, the State Department of Public Works should be authorized to make certain necessary improvements for removing the well-proved causes of injury to public health, which are beyond the control of the local authorities, upon the property within the jurisdiction of that department, as shall be recommended by the State Board of Health, approved by the State Engineer, and ordered by the Governor.

Though it may not yet appear to be demonstrated that any special legislation is necessary to secure the requisite action of railroad corporations, and the owners of mill-streams and waters used for hydraulic purposes, there are some very important questions relating to this subject, to which, no doubt, the attention of the Governor and the Legislature will be called by citizens, and by localities that are suffering from existing obstructions to natural drainage.

THE EXTENT OF PREVENTABLE CAUSES OF MALARIA IN THE STATE.

Though the present is not a proper time for stating what is the extent of *paludal malaria* in the State of New York, this Board has begun to ascertain, with reasonable accuracy, certain limitations of its recent prevalence in the different districts in which it occurs. These limits are found to have reference to the altitude of localities, the accumulation and decay of vegetable matter, the saturation and drying of grounds, or more properly, the fluctuation of the levels or

planes of saturation ("ground-waterstand") in wet grounds, and muddy bottoms; the stagnation of ponds and pools, and the fluctuations of their muddy margins; the partial and irregularly saturated condition of dwelling-grounds and village sites, the wet cellars; and all those conditions, domestic, local and climatological, which may be connected with any of these causes of disease.

While it is probably not true that all swamps are miasmatic, and that all saturated grounds are necessarily so; drainage, culture-cropping, drying and the general cleanliness of dwelling grounds, streams and ponds, are the known conditions upon which we must depend, mainly, for the prevention of paludal malaria, in those regions which are within the altitudinal range of its occurrence in this latitude; as nearly all parts of the State, that are situated within the lines of altitude, not exceeding 800 feet above tide level, are subject to the occurrence of malarial disease, when the conditions here first mentioned are present, the sanitary problems of prevention of it are worthy of all the study they will receive.

With a view to the foundation of correct and well-verified observations upon the ascertained conditions and limitations of miasmatic diseases throughout the State, and a correct medical statement of experience in regard to the times, places, circumstances, and results of the occurrence of malarial fevers and phenomena, the Board directed its committee on vital statistics to organize a method of inquiry for this purpose, to begin with a circular that should glean the best information from the medical profession in the State. This circular, and the body of evidence on the subject is presented in the accompanying appendix. The Board would notice the fact that, although it has become as common for persons, whose interest it is to do so, to deny or obstinately question that paludal malaria is known to be caused by any earthly thing, as it is for others to deny that there is any harm in fever-and-ague, yet malaria is a blighting evil, and miasmatic diseases are destructive. Whoever, and whatever, will remove and prevent its causes will confer measureless benefits upon the people, and add to the average of human life in the State of New York a large percentum of vigorous strength, general health, and length of days.

SANITARY INQUIRY RELATING TO PREVALENT ACUTE DISEASES.

Though the deaths in this State are being recorded from causes which the physicians subdivide into hundreds of kinds, by different names, there are some five or six diseases which destroy more than half of all who die; about one-half of these perish by acute and contagious

diseases, which sanitary science has proved to be among the most preventable of all maladies that flesh is heir to. Small-pox, diphtheria, scarlet-fever, measles, typhoid and typho-malarial fevers are diseases which the local Boards of Health as well as the State Board must oppose with whatever means the public health laws, and the resources of sanitary science, can offer. Other prevalent diseases which demand timely sanitary interference have been fatal in many localities. Measles and whooping-cough add their full quota to the preventable mortality which before long the people will learn more and more to guard against. Important investigations have been made in the localities where diphtheria, small-pox and fevers have prevailed. Many of the facts, gathered in these investigations, have been well quoted by the standing committee on vital statistics to whom this kind of investigation is intrusted. The results of this study appear in their place in the appendix.

The local Boards of Health are enabled by a very simple method of classified statements, upon cards prepared and furnished by this Board, to communicate to the central office the necessary information to enable the central to unite with local Boards of Health whenever informed of prevailing fatal disease. One of the most important procedures against the prevalent and wide spread contagion of small-pox was conducted by the local health authority of Buffalo, in a manner and with results which have been described in a brief report upon this subject in the appendix. Further proceedings to limit the extension of small-pox were taken by the Board at its meeting in May, with the design to contribute effectively to the prevention of the spread of small-pox along the pathway of immigrants, traveling from the Atlantic to the Western States and the Pacific. The means of information which are necessary for prompt action and for the useful co-ordination of the efforts of the National Board with the State Boards of Health has now been matured, the President having approved of the plan which has grown out of the propositions agreed to by several of the State Boards. It is a remark worthy of repetition in this place that, as regards the destructive pests which are spread from place to place by a contagious element, contagions current in the cities are on the railroad or highways of travel carried into the remotest villages and may be spread to every town. For this reason and others, the observation and records of prevalent diseases must be maintained, and in this State it is now required by law. The local Boards of Health must report these facts, and the State Board is required to give whatever advice and information it can for the purpose of repressing infectious epidemic diseases.

THE STATE SYSTEM OF REGISTRATION OF BIRTHS, DEATHS AND MARRIAGES.

In accordance with the seventh section of the organic law, creating the State Board of Health, the State system of registration and vital statistics has become sufficiently well organized to warrant the conclusion that the two most essential purposes which the Legislature had in view, in ordering that there should be a State system, as well as a local one, for publicly registering births, deaths and marriages, will be attained. These two purposes are :

First. That there shall be a central or State System of Vital Statistics.

Second. That in the development and maintenance of the central system of records of births, deaths and marriages, there shall be such local registration as will equally serve the sanitary, legal and economic interests of the people in their primary communities, and the highest interests of public economy and hygiene of the State as a whole. These two leading purposes became practically the equal and necessary parts of the whole system.

In 1847 the statute that provided a way by which the people in every county, city and town should keep their records of the three kinds of events that concern all families, and should be insured to all individuals, was left to execute itself; hence it remained a dead letter of law. Yet under that law, and the additional statutes, 322 and 512 of 1880, the State Board of Health has been able to lay the foundation for the State System of Vital Statistics. The important amendment of the general statutes, prescribing the organization, and defining the powers of local Boards of Health, as enacted by the Legislature in the summer of 1881, now enables every municipality, township and incorporated village to secure the complete and accurate local registry of its vital statistics.

Up to the present time the duties pertaining to this registration depended chiefly upon voluntary, and not enforced compliance with the directory language of the statute. No penalties have been directly imposed by the laws, and no salaried officers created. The compensation of persons, officially employed to make the registry, has been left in all instances to the local authorities. The law, chapter 512 of 1880, provided that the County Board of Supervisors should determine the compensation to which officers of school districts, towns and counties, rendering this service "shall be entitled," and provided also that the amount of compensation so authorized "may be audited and allowed by the Board of Supervisors of such counties."

The organic law of this Board requires that the "State Board of Health shall recommend such forms and amendments of law as may be deemed necessary for the thorough organization and efficiency of the registration." This Board is also required to "prepare the necessary methods and forms for obtaining and preserving such records, and to insure the faithful registration of the same in the several counties, and in the Central Bureau of Vital Statistics at the Capitol of the State." Thus the law and the distributed responsibility for securing the registry of vital statistics in the State, were found at the time the Board commenced its service, in June, 1880, and any degree of useful attention to these laws, manifestly would depend upon the success of the State Board in its relations to the Boards of Supervisors in the counties, and upon such influences and helps as could be brought to the aid of town clerks and clerks of school districts throughout the State. The last Legislature, just before adjournment, July, 1881, enacted an amendment to the general statute concerning local Boards of Health, having incidentally a useful reference to the proper supervision of the primary records, and their registry in the towns and villages; but the influence and usefulness of this amendment depends upon the effectual organization of local Boards of Health throughout the State.

The clerical duties of the registration remain, unless the local authorities otherwise direct, in the same hands which the former statute had designated, namely, in town clerks', and specified clerks in cities and villages. This amendment of law directs: "It shall be the duty of the Board of Health in each town, village and city, to have the supervision of registration of deaths, diseases, and the causes of death, and by its appointed officers, to examine all certificates and records of deaths and findings of coroners' juries, and to designate persons, who shall grant permits for the burial of the dead. . . . To supervise and make complete the registration of births, deaths and marriages within the limits of its jurisdiction."

The State Board of Health has therefore, during the past six months made it one of its duties to induce the organization of the local Boards of Health, as provided under the act here referred to, and immediately to aid and advise in the proper organization and beginning of the work of registration in each town, city and incorporated village.

What appears now to be most important in the experience of the local Boards, as well as of the State Board of Health, in this endeavor, and the duties imposed upon local Boards of Health may be briefly stated as follows:

A large majority of the people in the State have not, until recently,

understood, or even had much thought about the importance or the duty of registration of records of the marriages, births and deaths in their families, or in the community; and, with the exception of church records of marriages, and of the baptism of infants, as recorded by only a small number of the clergymen and priests, there has been no registry of those important events, excepting in a few of the cities; but even in none of the cities have these two branches of registry been at all completed.

The State laws now require that every birth and marriage shall be recorded as prescribed in forms prepared by the State Board of Health. Records of mortality, though until within the past year wholly neglected throughout the State, excepting in six cities, are now justly regarded by all enlightened people as a necessary duty connected with public health service. No objections have thus far been met with in the efforts of the State Boards, as well as of the local Boards, to secure prompt and faithful registration of deaths and their causes in every community. All the local Boards of Health thus far express entire willingness to carry the laws and regulations into full effect, as regards complete and correct certificates and registration of deaths, and the proper regulation of the movement and burial of the remains of the dead. The only source of delay in giving full effect to this branch of registry and vital statistics, consists in the slow, and somewhat tedious process of inciting and maintaining the necessary activity and competent supervision of local Boards of Health. To attain the desired completeness in this branch of vital statistics, the State Board will have to persist in its efforts for successive years. Indeed, in every country where there is successful registration, the central and directory government of it is more ceaseless in its surveillance and instruction than any other branch of public service. The study of the causes of mortality and disease, and the preventable sources of them that are continually filling new-made graves, are now counted among the first sanitary duties in all civilized countries. New York will no longer be counted among the States that are neglecting this duty. Hitherto all attempts to secure such registration in this State have failed, except so far as five or six city Boards of Health have enforced and provided for the duty. Henceforth every township, village, as well as all the cities, will be without excuse for any neglect or defect in the registry of mortality and its causes. Every human life is justly to be regarded as being, or having been, so important among the units and aggregate of the community that its record must be kept according to the laws and forms which the State prescribes; and, that notwithstanding death is the last epoch to be attested and registered in the public records, this final registry must gather up, and briefly, but accurately,

identify the individual, protect the name, and all the social and State interests connected with it, by records of the causes and circumstances of death, faithfully inscribed upon the public registers of mortality, so that it shall contribute to the knowledge of life and health, and to the art and duty of saving them. This duty is replete in all its parts with importance to the public care of health and life. The State of New York has judiciously relegated to every local Board of Health the responsibility of the supervision and enforcement of registration laws relating to it. *Birth* gives the initial facts for every registration of the individual of a population, whether born to honor and wealth, or to dishonor and penury. Each community, as well as the whole commonwealth, has such concern and responsibility for the welfare and rights of every human being within its jurisdiction, that the records of the birth, and all its legitimate heritages, will ever be regarded as dutiful in a civilized country. To deny, or oppose, or deride this duty of public registration of births, is to promote a condition of barbarism and injustice to individuals who are deprived of a registry of facts which may fail to be so attested and inscribed, as to secure their normal rights, and such honor and hereditaments as should appertain to them. The physiological and hygienic truths with which these new lives are ever associated, if correctly observed and recorded by suitable methods for tracing identity of relationships, ages, social and industrial conditions, etc., will be found to be of greater and greater importance, and of more and more dignity, as well as physical concern, as the number, completeness and accuracy of birth records go on increasing.

It is proper that this Board should here state emphatically that the birth registers are not in danger of having inscribed upon their pages records of dishonor and vicious heritages; there is not a public register of births in this State that is liable to contain such things. Even the records of illegitimate births are made with all proper care and completeness without violating this rule. There has not yet been an instance of any grievance given to any family or, so far as we can ascertain, to any individual by means of the birth record.

So important are the registry records of the individuals who are added to the population by birth, that in all civilized countries it is made the duty of the State, not only to obtain and preserve these records, but to provide for, and make obligatory, the preparation of the individual records by the first of kin, and by the professional attendants who are responsibly cognizant of the individual birth. The ecclesiastical provision and requirements in this matter were long ago found insufficient, even in England and France; yet the given or baptismal name is important in connection with this branch of

public registration and according to the first general act providing for the birth registry in New York, the registries kept by the clergy of the baptismal name, are required to be suitably accessible to the registering officers. Every registry office is now supplied with name-cards for securing correct returns of the full name of every child.

Marriage, designed and legally appointed, as it is, in the social economy and moral laws that govern the race, to *found the family and successive generations*, makes a class of records that in this State and for the nation will be made public, whether the laws require one or another mode of official registration of facts. While in most countries the registration of marriages is strictly enforced by the *Code Civil*, there is not, and never should be, any disrespect of the *Code Ecclesiastical* by the State and local registering officers.

Thoughtful citizens in all parts of the State of New York have greatly deprecated the want of a system of civil registration of marriages, and the defectiveness of whatever registration has hitherto been required under ecclesiastical regulations in the different religious sects. Faithfully as many of the clergy perform their duty, as they understand it, few of them follow any standard that is sufficiently correct and complete to answer the great design of marriage registration. In short, the ecclesiastical requirements and methods by no means meet the necessities of society, though they may be entirely appropriate and sufficient for the religious or the sacramental purposes they serve.

The State Board of Health finding that the law imposes upon it the duty of prescribing forms and methods for securing correct and complete records of marriages for public registration, has adopted forms which, under the best administration of the civil and the ecclesiastical codes relating to the marriage registry, in the most enlightened nations are giving the best results and greatest satisfaction. The form prescribed under this Board is identical with that adopted in the city of New York and in the city of Brooklyn, where for some fifteen years they have been in constant use. They are also nearly identical with those of Massachusetts and Rhode Island, and of Great Britain, Belgium, France, and Germany.

It is creditable to the leaders of thought, and to those highest in authority that in the different religious denominations in the State of New York, from those least under any central ecclesiastical instructions, up to presbyters and revered dignitaries, as is shown by the practice of bishops and of the Roman Catholic Cardinal, their compliance with the duties and prescribed forms of marriage registry, as a civil obligation, bears testimony to their correct estimate of the design and uses of such records. The blank forms for marriage registry are now distributed throughout every county and township in the State, and

have been placed in the hands of nearly all persons whom the statutes permit to solemnize or attest the marriage ceremonials. Thus far this Board has offered all the aid and information which the laws have required it to offer to the people and to all professional persons who are concerned in the sanctity of a public registry of legalized matrimony. Like the registers of birth (which are obviously important for sanitary records and references), the public registers of marriage are kept by the town clerks for the townships, and in cities and incorporated villages, with few exceptions, by the special registering officer or clerk appointed as registrar. Where no special appointment is made, the city clerk and village clerks are the registrars under the statute.

Death and its causes will henceforth, by virtue of chapter 431 of 1881, be registered under the immediate supervision and regulation of Local Boards of Health, wherever such Boards are in operation. The last statute permits and provides that the town clerks and the registering clerks established by law, in villages and cities, *may* still keep, as supervised by the local sanitary authorities, all the records of births, deaths, and marriages. Every Local Board of Health is, henceforth, required to supervise and make complete the registration of births, deaths and marriages within the limits of its jurisdiction. Thus, without repealing any laws relating to registration, the amendment here referred to (chapter 431), supplies for the present, a much needed source of local provision to enforce complete and perfect registry in every community in the State.

As it is only a few months since the towns and a majority of the incorporated villages in this State began to organize their local Boards of Health effectually, the supervision of the registry of vital statistics, and the official regulation of burials, and the transfers of remains of the dead, are new duties with which the communities in this State are now for the first time becoming accustomed, excepting in a few cities in which registration and sanitary regulations concerning burials were established by a local sanitary code. In this gradual establishment of regulations to secure complete and accurate registration of death and its causes no inconvenience and no increased cost need to be incurred. The new laws are working acceptably, and they are now in operation most effectually where the local Boards of Health have become well organized.

Town clerks, clerks of incorporated villages, and justices of the peace have begun to perform their parts in the duties of registration; and in only a few instances has it been deemed necessary by town Boards of Health to designate any other person than the town clerk for the clerical duties of inscribing in the public registers the attested records. In many of the towns the duty of issuing the Burial and

Transit Permits is performed by the town clerk, who, in many widely scattered communities, with the approval of the local and State Boards of Health, is aided by one or more of the justices of the peace, in accordance with chapter 512 of 1880. The report by the committee on vital statistics herewith submitted gives illustrations of this duty, and shows that public convenience, as well as a strict compliance with the laws and the interests of the public convenience, are well respected and secured under these and the various other additions which have been adopted for the convenience and completeness of the service in this branch of the Board's supervisory duty.

The sanitary regulation of burials has been made the subject of so much public discussion in recent times, especially with reference to certain supposed hygienic necessities of returning to the ancient practice of cremating the remains of the dead, that we do not feel at liberty to pass lightly over this matter of regulating burials and transporting remains of the dead by public carriers. Though this Board is not responsible for the framing of the statutes relating to this subject, it has accepted and acted upon them in such manner as to secure the best practicable results with the least possible inconvenience.

The objects in view in obtaining and attesting the personal record of each and every individual who dies are that the identification as regards the individual shall be assured; that the family, the nativity, the residence and the occupation, as well as the sex and age of the decedent shall be recorded; that the most concise, yet correct, statement of the death and causes of death shall be given, and professionally or officially attested by an attendant or other competent witness; also that the place of burial and the person in charge of it, or of the removal, shall be recorded; and, finally, that the local sanitary authorities shall, by suitable regulations, be daily informed of the facts and certified records of causes of the deaths which occur within their jurisdiction.

The secondary objects of this public registry are secured in the attainment of these, the essential ones; for they comprise and require chiefly these specific attestations of facts especially those which relate to causes, residence, age and occupation. The sanitary considerations and in many instances in the cities and towns, the protection of health and of life will depend upon the prompt and faithful transmission of these items of information, to the proper local authorities. As mentioned in this Board's first annual report, one of the most distant school district clerks in the State sent forward, as soon as received, copies of the certificates of five deaths from diphtheria in little children, saying to this Board, "it seems a duty to give this information." Immediately it was ascertained by a sanitary officer that certain neg-

lected localities, as well as neglected contagion from a visitor in the neighborhood, gave the necessary basis of information for applying the means to repress the disease.

In the report by the standing committee on vital statistics, and in statements submitted by the secretary, abundant evidence is presented to show how important it is that the registers of mortality, the pages of which remain closed in no community many days in succession, should be regarded with a watchful concern by local sanitary officers.

In the words of the committee on registration: "Regarded as the ever visible barometer of life and health in the communities of this State, the death rates when read in connection with the local and significant, but variable circumstances of mortality, are so important that every city and district in the State should so keep this registry as to yield the most useful results to public hygiene and to sanitary science."

The organic law of this Board provides that it "shall recommend such forms and amendments of law as shall be deemed to be necessary for the thorough organization and efficiency of the registration of vital statistics throughout the State." Therefore, whatever shall be found necessary will be thus recommended, and the Board is unanimously agreed in now recommending that the Legislature shall confer the necessary authority to enable the executive officer of the Board temporarily to supplement, by means which the Board shall have approved, whatever deficiency is discovered in the duty of registration in any town or place in the State. It is not improbable that at a later period, it will be found advisable by the Legislature to supersede the existing mixed authorities upon which this branch of public service now depends, but the fact that to local and State sanitary authorities the chief duties and first uses of the records of vital statistics belong, must be conceded. It is not improbable that the complete reorganization of local Boards of Health throughout the State will insure the operation of all the necessary agencies and influences for complete as well as accurate registry of births, deaths and marriages in every community. But certainly it seems inexpedient to ask the Legislature to create special offices, and incur any avoidable public cost in a branch of service that is so closely associated with the interest of the public health. The existing official machinery must be tested.

In concluding this statement the Board deems it important to recommend that the certificate of death as now required by the laws of 1880, shall, without exception, be secured and duly examined by the local health authorities before the burial of any person in this State.*

*While this Report is passing through the press an amendment of the general Public Health Law (chapter 351, of 1882), has prescribed the methods of attaining the ends here mentioned.

Though this is at present required by chapter 512 of 1880, it appears to be necessary that this rule and the obtaining of an authorized permit for burial — upon the acceptance of a certificate of death — shall be insured and made invariably obligatory by a few separate words of law that cannot be disregarded by recording clerks, or any other local authorities; for this is a matter quite essential to public order, and to the complete record of death and the causes of mortality. This rule would include all cases that are subject to the coroner's view or verdict as well as all others made under indifferent local administration, of burial without a suitable record of the causes of their "taking off." Shams, shame and fraud will be in this way prevented; while records of mortality in this State shall henceforth be made complete and creditably accurate.

The indecent haste to bury the dead without a record in many instances is but a mask to wrongs that no civilized community should permit to go unsearched and unguarded against. The "Crownor's Quest Law" oftener *fails to find* the true cause of death than to *record* even the probable causes; but whatever it discovers has no registry, except in two or three cities. Human life in various quarters and in unexpected ways is at a discount, while "grave-yard insurance" and other methods of wrong have no restraint in States which disregard the sanctity of life and neglect the registry of death and its causes.

EXPERT SERVICES:—ENGINEERS' AND OTHERS'.

The first service of this kind during the past year became necessary in connection with the investigation relating to the causes and means of prevention of the stench nuisances in Newtown creek district. The best aids of chemistry and some other departments of knowledge were obtained. The Board has found it necessary in the duty imposed by the Governor's orders, concerning these effluvium nuisances, to continue this kind of assistance until the present time. It is believed, however, that it may be discontinued at the end of the present month (December).

Sanitary and civil engineering assistance is required most frequently of any kind of expert service, and has been called for in numerous instances. Some of the results of this appear in the appended papers. Occasionally it has appeared that local sanitary authorities were at a stand still in their efforts to proceed from sheer necessity for a day's service of an expert for some special inspection and advice. The State Board has at once responded to any worthy request of this kind, and thus far, with excellent results. It is fortunate for the success of sanitary work under local authorities that there is a steadily increasing

number of civil engineers, and experts in special branches of the applied sciences and industrial arts, who are preparing and prepared to render practical assistance. It is proper here to express the opinion of this Board that the limited amount of funds which the law of 1880 provides to be expended for such expert work should be increased. There is no doubt it would be wise economy to augment the total appropriation for this Board's service to such an extent as to authorize an expenditure not to exceed ten thousand dollars annually in payment of the various kinds of expert labors employed in accordance with section 10 of chapter 322, of 1880. Though some of the members of this Board themselves perform much of the expert labor required in the service, they cannot justifiably undertake all this kind of duty. They share it in every instance, and are aided by it in their most responsible undertakings.

HEALTH IN THE SCHOOLS.

The interests of health in the public schools could not, without wrong to the people, be overlooked by this Board. These interests are identified with the health and happiness of the families of the State. They are in the best sense public health interests. Individual life and the immeasurable value of lives sound and vigorous, and of minds and moral natures which are both truly educated and in high health, are the richest treasures of a State as well as of individuals. This is the standpoint from which to view the whole subject of health in the schools.

Early last winter the correspondence of the Board and various questions that were appealed for advice and instruction, showed that there is need of sanitary supervision of schools in cities and populous villages. Certainly there is reason to maintain a practical kind of sanitary inspection of school-houses. Small-pox, diphtheria and other contagious maladies appeared in various parts of the State to be so facilitated in their propagation by the assemblage of pupils in crowded school-houses, where these contagions gained entrance, that how to apply the necessary means for preventing the local conditions which favor the spread of contagious and other maladies through the common schools became a most important and practical question.

The first appeal to this Board was in the nature of a protest which had been transmitted from a village of nearly ten thousand inhabitants, in which a school officer claimed that the village Board of Health and the School Board should not be permitted to carry into execution an order then just issued to require the vaccination of all school children. In this case small-pox appeared in certain families that sent their children to one of the largest schools. The appellant

was advised by this Board to give his support to the action taken by the local authorities as a duty toward the public at large, and that he should merge any personal and theoretical objections, in order to secure the greatest general protection and the public welfare. That gentleman promptly adopted this policy, and at once had his own children vaccinated. This was an important concession by a wealthy, influential and most worthy citizen, whose timely example established the success of vaccination in the schools. The great school which was closed by the authorities was opened in less than a week, and the pupils returned with evidence of having complied with the rule as provided under the statute of 1860. In various instances there was such delay in vaccination that it became necessary to urge that certain common schools should be temporarily closed. In one instance in Sullivan county, the teacher of a large district school, when small-pox had been introduced by a pair of slippers that had been taken from a small-pox hospital, 100 miles away, so opposed the request that his school should be temporarily closed, that a large proportion of his pupils and a great number of families were attacked by the contagion. It spread through the township, causing great alarm and suffering, and killing no less than six of its victims.

Diphtheria has appeared in so many schools, and, like scarlet fever, has proved so terrible a destroyer of child-life, that this Board, during the winter of 1881, ordered the issuing of a circular of information in concise and practical terms. This duty has been extended to the subject of infections and contagions in general, and, specifically, to the sanitary repression of diphtheria, scarlatina and small-pox.

The fact that the clothing of the children, the apparatus and furniture of school-rooms, the water and drinking-cups as provided in common schools, and especially the contaminated atmosphere of the crowded school-rooms themselves, and the ready communication from person to person of the unseen infectious causes of each of these diseases, induced this Board to direct its Committee on Public Institutions to prepare a plan, with suitable methods for such sanitary inquiries and the diffusion of such practical suggestions by means of a circular of inquiry or otherwise, as shall incite action that will protect the health and lives of school children throughout the State.

The proposed plan of inquiry for this purpose has been the subject of much study, and is now one of the organized branches of this Board's public duty. It extends to all the essential conditions which should be provided for the security of health in schools and seminaries.

This subject proves to be so full of interest to teachers and officers of schools, and to parents and guardians of pupils, and such are the results of the present systematic inquiry and suggestion of sanitary

duties which everywhere attend this research, that the Board has no doubt that it is expedient to keep up this service until every school-house in the State shall have been brought into a safe sanitary condition, and until teachers, school officers and parents alike shall comprehend the duty of guarding against preventable evils to the health and physical well-being of school children. The subject is presented in the report of the standing committee on public institutions, and in carefully studied statements prepared under the direction of the board, by Dr. David F. Lincoln, of Geneva, an expert in school hygiene, who for several months has been engaged in a critical examination of school-houses in several of the counties.

This branch of sanitary service has extended to all classes of public schools, and the Board believes it is sure to prove a most comprehensive means of protection to health in schools and families. Events in some of the large collegiate institutions in other States, and several instances in this State, have within the past few years given sad illustrations of the local causes and destructive prevalence of diseases which are in an absolute sense preventable, and whose prevalence in any college or other school, must be recognized as proof of culpable ignorance and neglect of sanitary duties.

In thus organizing a branch of special sanitary effort for protection of the health of children, it is designed to contribute the best means of information and security, without seeking to interfere with the official responsibilities of those who must be held accountable for the schools and whatever occurs in them. Evils are to be prevented, and the inspection, counsel and suggestions incident to this branch of duty cost the State but little, yet the results will be among the best which this Board can secure. Informed and forewarned, those who are responsible should be fore-armed for the prevention of harm to health and life of school children.

TENEMENTS. — PROTECTION OF HEALTH AND LIFE OF TENANTS.

As the sanitary supervision and interests of the tenement population in our chief cities now demands the most important kind of public health service, and has presented numerous vexed problems in legislation and in local administration, to secure the general protection of public health as well as the protection of the lives of the tenants, so it is found that whenever numerous poor families are housed under one roof, entering through one doorway and using, in common, those dwelling facilities that among the rural population and the more affluent in the cities, each family separately possesses, the massing of large families in close quarters, or the crowd-

ing together of badly appointed tenements, upon the ground-level; all alike conduce to the crowd-poisoning and filth diseases which prove the necessity for immediate and adequate provisions of law to limit and regulate the very abuses and evils which the inhabitants of rented tenements do themselves ignorantly induce and suffer in their domiciles, for the fitness and preservation of which they take little or no heed. With more than half of the families in the State dwelling in cities, and with nearly one-half of these, at least in the metropolis, crowded in what the law defines as "tenement houses," the State Board of Health regards with just concern all those sanitary perils and public interests which such conditions of habitation and life of the more ignorant and dependent classes imply. For this reason a brief practical statement of facts which concern the State, and have a direct relation to public health, as connected with the tenement-house population in cities and manufacturing villages, is submitted in a subsequent division of this report.

This subject has, in the view of this Board, acquired great importance since it has been proved in the crowded metropolis itself, where great peril to life and public health was increasing with the crowding of tenements — that intelligence and capital can be successfully invoked to prepare suitable and really healthful dwellings for the poor classes, and where the local sanitary authorities are at last required by law to prescribe the definite conditions of space, construction, light and ventilation which owners and builders shall provide in all tenement houses.

That such legislation secures the desired result is shown by the fact that since the amended Tenement House act for New York city became a law, about three years ago, there have been erected in that city alone tenement and apartment-houses sufficient for the accommodation of 100,000 persons, the plan of every house having been previously passed upon by the local health authorities, and the owners and architects having been required to comply with such rules and regulations as would secure light and ventilation for every occupied room.

Equally satisfactory conditions of sanitary protection are being devised in certain manufacturing towns where the capital which controls and develops the industries has been at the same time applied in the construction and sanitary outfitting of healthful dwellings for the family and tenement homes of operatives. In one instance the Board has found upward of nine hundred brick dwelling-houses so constructed and controlled; and in this instance the factory owners have for the past year maintained an accomplished sanitary inspector for the hygienic supervision of their dwellings and the factory, and for vaccinating and otherwise protecting their thousands of employees.

The military maxim that "Health is the strength of Armies," is found equally true in the cash value of employees and in the strength and wealth of the State. The sanitary improvement and public care of life and health of the tenement populations must henceforward be esteemed necessary in repressing the preventable causes of pauperism, misery and crime. Public health is in danger whenever the sanitary safety of the poor is disregarded.

In concluding this report the Board is glad to bear testimony to the sincere and practical interest evinced by the people in whatever they correctly understand concerning the means for protecting health and life; and it has been an obvious duty to so devise and conduct the Board's work as to contribute as much as possible to the knowledge and practical understanding of the questions and attendant duties which most affect the sanitary interests of the community and all classes of inhabitants. Without separate powers of its own to interfere with local and individual affairs, yet with duties which have compelled it to advise and contribute to sanitary efforts in every town and every school district, the Board has received from the local officials and all other citizens the respectful attention and deference to its counsels and requests which are essential to proper understanding and discharge of sanitary duties. The only exceptions to this general acquiescence and responsive compliance have been caused by certain delays or failures of county or town authorities to provide the means prescribed by law for the performance of certain local duties. In this matter, as in that of an invariable and obligatory maintenance of the local sanitary regulations and registry duties, there may be a necessity for a few simple amendments of laws; but no change is necessary in the spirit or policy of the statutes, which both recognize and fully sustain the local authority as being responsible for the maintenance of these obligatory duties.

In the belief that the organization of local Boards of Health throughout the State will soon be complete, the State Board will continue to devise and maintain the labors which, in common with the movement of the best citizens in every county, will induce and shape the most definite plans and comprehensive methods of sanitary improvements and enlarged resources for the protection of health and life. The enhanced real values and useful outcome of the lives which are blessed with health and all that hygiene in the family, the school, the community and the race would imply and promise, are the awards that wait upon enlightened and faithful care of health in the State as well as in the family and its successive generations. The miserable and unfortunate of the present time might, with some relief to themselves, die, and be buried with other burdens of the community, yet the

identical causes of the same miseries and burdens of the people would reappear if the sanitary and moral resources of knowledge are not interposed. Even the unworthy and wantonly perverse classes of society have to be reached by the beneficence of hygiene in order to protect the community at large.

The spreading infections which destroy children are domestic and neighborhood pestilences of rich and poor alike, and they strike down the fairest and most promising of the young lives ; while malaria and the fever-poisons, which afflict the humblest laborers and their families, also vex and prostrate any other persons who inhale or drink the same unseen and unsuspected causes of these diseases. The public care of health is for the benefit and protection of all classes and ages alike. Its preventive, watchful and humane provisions and advice among the needy and the reckless, its ceaseless inspections and searching for causes of disease and untimely deaths, its faithful enumeration and registry of the dead, and its timely inquiries and instructions, must extend to all ranks, ages and places in the State. This view controls the policy and incites the efforts of this Board in all the relations it sustains to the people.

Respectfully submitted,

EDWARD M. MOORE, *President.*

ERASTUS BROOKS.

J. SAVAGE DELAVAN.

WM. M. SMITH.

JAMES T. GARDINER.

JAMES G. HUNT.

C. F. CHANDLER.

HAMILTON WARD.

ELISHA HARRIS, *Secretary.*

AN ABSTRACT OF THE MINUTES AND TRANS- ACTIONS OF THE BOARD.

FIRST QUARTERLY MEETING OF THE BOARD IN 1881.

ALBANY, *February, 9th.*

All members in attendance except Prof. Gardiner, who was absent from the State.

The chairman of the sanitary committee submitted the papers which had been referred to that committee relating to effluvia nuisances in the Metropolitan District, and upon his motion it was

Resolved.—That a special committee be appointed by the chair to proceed to New York city to take testimony with regard to the nuisances alleged to exist there in the petition of citizens referred to this Board for examination by the Governor, under date of January 5th, 1881, and that this committee be authorized to employ a stenographer, and such experts and agents as may be necessary to complete the investigation.

That the memorial of citizens with the reference to the Governor, be referred to this committee, and that such special committee report to this Board the evidence taken with their conclusions thereon, with all convenient speed.

The following commissioners were appointed to be such committee for this investigation: Dr. J. Savage Delavan, Hon. Erastus Brooks and Dr. Elisha Harris.

The subject of town and village Boards of Health was discussed and the views of the attorney general were elicited. Mr. Brooks submitted a communication from ex-District Attorney Rawson, of Richmond county, concerning the necessity for better definitions and distinctions of the jurisdiction and duties of town and village Boards of Health.

A communication was presented from city authorities and physicians of Hudson inviting the Board's attention to the South Bay nuisance of that city. The physicians separately reported as follows: "We, physicians of the City of Hudson, consider that any closing of the present opening in the Hudson River Rail Road embankment crossing the South Bay will be productive of malarial disease and injurious to the health of the citizens, and urge upon the Board of Health to at least maintain our present opening." (*Signed*,) John P. Wheeler, M. D.,

Geo. E. Benson, M. D., Geo. P. Salmon, M. D., A. P. Cook, M. D., C. P. Cook, M. D., F. F. Cochren, M. D., H. Lyle Smith, M. D.

The secretary was directed to reply and to state that the subject had been brought to the attention of the Board.

Communications were submitted from Hon. Dr. M. M. Fenner, chairman of assembly committee on public health, relating to explosive oils and to vivisection. It was

Resolved, That the sanitary committee be directed to report as soon as convenient upon the cause and prevention of accidents from kerosene and similar oils.

Hon. M. Phillips, of Orleans county appeared before the board to ask what action could be taken for abating a nuisance caused by the Erie canal near the village of Holly, in that region of the town of Murray. Malarial fever and its associated evils are attributed to the obstruction of drainage. In reply the Board advised Mr. Phillips that a statement of the case should be made directly by the town authorities, to the State Engineer, and also to the Governor of the State. The Secretary was advised by the president and members to obtain medical facts directly from the physicians in that region. He said that he would do so.

On motion of Mr. Brooks it was

Resolved:—That the State Board of Health shall offer to supply the towns and counties with blank forms for the registry of births, marriages, deaths, burials, at net cost, and that the proper local authorities be notified of this action.

The president submitted communications from citizens of Auburn asking advice upon practical questions of sewerage in that city, and, on his motion, the following resolution was adopted:

WHEREAS, Citizens of Auburn have requested the opinion of the State Board of Health in relation to the proper location for public sewers in that city, therefore

Resolved:—That the secretary of this Board be authorized to express to such citizens and others whom it may concern, that, in the opinion of the State Board of Health, *no public sewer should be constructed beneath private dwellings, manufactories, or public buildings, or where avoidable, through private grounds; but in every instance along streets or public thoroughfares.*

Resolved:—That the committee on Registration and Vital Statistics is hereby authorized to have three registers made for immediately commencing the registration of deaths, births and marriages, in the State Bureau of Vital Statistics.

WHEREAS, Small-pox is now prevailing to a dangerous extent in many towns and cities in the State, and

WHEREAS, Except in New York city, the cases of this disease are not published immediately, but intentionally concealed, therefore

Resolved:—That in any amendments which may be made to the law creating this Board, a section should be added making it a misdemeanor for the Health Officer, or Sanitary Superintendent of any city, town or village to neglect to report to the Secretary of this Board any case of small-pox occurring in his district within three days of its coming to his knowledge.

Resolved:—That the law should also provide for requiring the attending physician to report cases to the Health Officer and Sanitary Superintendent. The discussion of the merits of the Pharmacy Bill for the

better regulation of the retail and prescription business in articles used in medicine was taken up, and on motion it was

Resolved.—That in the opinion of the State Board of Health it is very desirable that laws for the regulation of the practice of Pharmacy and the sale of poisons should be adopted for the purpose of protecting the public health from incompetent Pharmacists and from the careless sale of poisons.

Resolved.—That the form of public notice by School Officers, which was adopted by the School Board, district eight, of Amsterdam, Montgomery county, be printed as a sample by this Board to be issued by the secretary to all school districts in the State as illustrating an easy method of securing public attention to the duty of vaccination in accordance with the statute of 1860.*

Resolved.—That in legislation proposed, the Supervisors of the towns of the State be authorized and required to appoint Boards of Health in their respective towns, and that in towns where there are villages the trustees shall make the appointment of the local Board of Health, whose work shall be confined to the territory known as the village. And in cities (except New York and Brooklyn) the Mayor and Common Council shall make the appointments and that in no case shall a member of the Board of Health be selected from the city, county, town or other local officers; and that in each such Board of Health there shall be at least one physician.

Resolved.—That in all Boards of Health it shall be the duty of the Health Board to appoint and define the work and power of the health officer.

Adjourned.

SPECIAL MEETING. NEW YORK, APRIL 18.

Six members in attendance. Business,—to hear and act upon report of committee on Effluvium Nuisances. Dr. Delavan, chairman of the committee, presented the report.

The report was accepted and adopted. It was

Resolved.—That in the opinion of this Board the report of the special committee upon the stench nuisance complained of in the city of New York clearly establishes the fact that the complaints are well founded, that the odors emanate chiefly from the portions of Kings and Queens counties bordering upon Newtown creek, and that they are caused by carelessness in the management of the business of refining petroleum, discharging the refuse from the oil refineries, the handling of sludge acid, the making of cream of tartar, the manufacture of superphosphate fertilizers by means of sulphuric acid, the rendering of fat, the boiling and burning of bones, the manufacture of ammonia and the transportation and storage of manure.

Resolved.—That in the opinion of the Board the managers of the Empire, Standard and Astral oil refineries, and the owners of the cream of tartar factory, have shown themselves to be commendably active in their efforts to control all sources of nuisance, and with the advice of competent experts have introduced improvements which accomplish

* See [No. 41] in series of Sanitary Papers, p. 121 of this report.

that result; therefore the Board urges upon the Governor the importance of requiring the owners of other oil refineries to adopt the same or other equally effective methods of accomplishing the same results.

Resolved:—That in the opinion of this Board no treatment or utilization of the sludge of the oil refineries should be permitted in the neighborhood of Newtown creek, nor should any portion of it be discharged into the waters of the creek. It should be removed in closed tanks entirely beyond the populous districts, without dilution or needless exposure to the air.

Resolved:—That the manufacture of super-phosphates, from refuse and putrid animal matters, as now conducted, is a source of emanations which should not be endured, nor should such putrid materials be stored or transported in open vessels.

Resolved:—That the improper rendering of fat, and the boiling and burning of bones, and the manufacture of ammonia constitute nuisances of great magnitude, which can be easily abated by the adoption of approved apparatus already in use in many establishments.

Resolved:—That the removal of manure from the large cities and its transportation to the farms where it is finally utilized without annoyance to the residents of the localities where it is produced, or through which it passes, is a problem involving many serious difficulties, but the Board is unanimous in the opinion that it should not be allowed to accumulate in the neighborhood of crowded localities.

On motion it was

Resolved:—That the report and resolutions thereon be recommitted to the special committee with instructions to lay before the Governor the resolutions and such facts connected with the report as may be deemed expedient.

Mr. Brooks submitted the following statement in regard to the Kill-Von-Kull nuisances:

"The attention of the board of health having been called to the unhealthy and unsightly condition of things growing out of the factories on the Kill-Von-Kull—the navigable and much used stream of water which separates the north shore of Staten Island from the opposite shore in the State of New Jersey,—respectfully asks the Governor of the State of New York to communicate to the authorities of New Jersey the following facts:

"1st:—That along the waters on the New Jersey shore—especially on the shore opposite to New Brighton and West New Brighton,—nuisances and offenses emanate from the oil refineries and factories of very serious injury to the comfort of the whole people, on the New York shore, and at times from the effluvium in the air and the contaminations in the water affecting the health of the people. When the wind is in the direction of the island, the offensive odors extend for two or three miles inland, compelling at times the closing of windows and preventing the proper and necessary ventilation of private dwellings.

"2nd:—The water is often covered with oil flowing from the factories into the river and reaching the opposite shore and destroying all pleasure and cleanliness formerly enjoyed from the use of public and private bathing places.

"3rd:—The smell from the gases and sludge coming from the factories is not only personally offensive and especially affecting the sensi-

bilities of sick and nervous people, but the material and contents of buildings all along the shore are discolored from the same cause.

"4th:—The examination and experience of the New York State Board of Health, and of the Boards of Health in the cities of New York and Brooklyn, and elsewhere in and beyond the State of New York, have demonstrated the possibility and the economy of removing or abating all these nuisances. The worst of them composed of sludge should be removed, and all existing nuisances relating to gases, oil and smoke can be abated to the extent of at least ninety per cent, and this without loss to the owners of the property which produces the nuisances. The proper combustion of coal and other fuel, and the proper regulation and control of gases by consumption is the easy, certain and effective remedy for what now results in so much personal discomfort and so much popular indignation.

"5th:—Most of the buildings on the north shore of Staten Island are private residences, occupied by families long residing on the island, and from the causes here named, and for the first time their homes have been made uncomfortable, and in the case of many of their inmates unhealthy, from causes beyond their reach, because wholly under the control of a neighboring State and people. They therefore earnestly and respectfully appeal to the authorities and people to remove this great evil from their midst, and the State Board of Health respectfully asks the Governor of the State to aid the State Board and the people of the village of New Brighton in asking the neighborly interference of the State of New Jersey to remove a public affliction wholly under their control."

On motion it was unanimously

Resolved:—That the statement here submitted by Mr. Brooks be transmitted to the Governor,

The secretary submitted to the Board a petition and papers referred by the Governor to the State Board of Health for examination, from the proprietors of the Oriental Hotel, Manhattan Beach, Coney Island, and suggested that suitable action be taken in reference thereto.

On motion it was

Resolved:—That the special committee on effluvium nuisances be directed to continue its investigation in the direction indicated by the above petition, and report its findings to the annual meeting of the Board in May.

Prof. Waller submitted his report on the chemical nature of effluvia produced by certain manufacturing operations.

On motion it was unanimously

Resolved:—That the committee having charge of the subject lay the report before the Governor with the paper of Prof. Waller incorporated inviting special attention to the expert inquiries that had attended the investigation suggesting the transmission of these documents to the Legislature for publication.

On motion it was

Resolved:—That under the direction which the president shall give to the committee on drainage, sewerage and topography of which he is a member, it shall proceed to take whatever action may be deemed necessary in the following places: Auburn, Geneva, Watkins and the abandoned canal regions, Hudson City, Croton Falls, Cortlandtown and the Yonkers district.

The secretary called attention to the necessity of the State Board

of Health taking action in regard to answering the question now urged upon its attention: Shall it be considered safe for the public health of the localities concerned, and of the State, that the lake-level of Seneca lake should be raised to any height exceeding its mean natural level as marked by the old monuments along the shore?

After discussing the question it was unanimously

Resolved.—That the committee on sanitary drainage, sewerage and topography, through the president and secretary, give such temporary advice as may be in their judgment necessary, based on accurately stated facts, concerning the proposed raising of the level of Seneca lake, as respects the malarial grounds that may be caused by any considerable elevation of that level.

The secretary called attention to the malarial district in the town of Murray, Orleans county, in regard to which Hon. M. A. Phillips, member of assembly from that county, was heard at the last meeting of the Board. He explained his recent visit to the place in company with an assistant engineer of the canal service, and suggested that the president and secretary could safely give the opinion that Mr. Phillips sought, namely—that the swamp between Holley and Hulberton, south of Mr. Cole's property, should be immediately drained.

Adjourned.

ANNUAL MEETING. ALBANY, MAY 10, 1881.

All members in attendance except the attorney-general.

The secretary submitted a statement of the Board's work during the past year and suggested that advantage be taken of the opportunity which Prof. Gardiner would have while in Europe to make observations for the use of this Board in regard to different systems of sewerage construction and sewer outflow in cities and villages.

On motion it was

Resolved.—That in view of the practical importance of drainage and sewerage improvements as illustrated in England and other parts of Europe, Prof. Gardiner is hereby requested and commissioned to make whatever observations and investigations he can concerning this subject during his tour in Europe and to report the results thereof to this board.

Prof. Gardiner was requested by the president to suggest a few names of engineers best known and approved by him to aid the Board during his absence, as occasion may require under the resolution adopted at the last quarterly meeting. Prof. Gardiner named five such civil engineers.

On call of the president the reports of the standing committees were made.

Mr. Brooks also reported that the two houses of the Legislature had inserted in the supply bill an appropriation of twenty thousand for the expenses of the Board for the fiscal year commencing on the first of October next.

The report of the sanitary committee being called for, Prof. Chandler said, that there were two matters requiring investigation which would entail a small expenditure.

1. Water pollution and water supply.
2. Determining upon the instruments and methods for testing petro-

leum. He asked that the sanitary committee be authorized to employ two chemical analysts for the next three months in analyzing samples of water collected from various parts of the State. The sum of four hundred and fifty dollars would be sufficient for the whole work.

On motion it was

Resolved:—That the amount of money appropriated by this Board at the last quarterly meeting for the analysis of waters be and is hereby increased to the total amount of four hundred and fifty dollars, to be expended in maintaining the services of two analytical chemists for three months of the present summer.

Resolved:—That the chairman of the sanitary committee is hereby requested to prepare the necessary instructions and schedule of questions to be used in the selecting of samples of water for analysis to be issued by the president and secretary, with the Board's request for a statement for suspecting the purity of the waters.

Resolved:—That the sanitary committee be authorized to spend a sum not exceeding one hundred and fifty dollars, in prosecuting the investigations preparatory to testing petroleum in establishing a standard for such test in this State.

The secretary called attention to the wide diffusion of small-pox in the different towns of the State and the responsibility of the Board in relation thereto and suggested the importance of rules for personal quarantine and domestic regulations applicable the State over.

The president suggested that there should be an instructive memorandum prepared and supplied to the local sanitary authorities, pointing out the best mode of procedure for abatement of nuisances and the execution of sanitary rules and regulations. A convenient four page manual illustrating what to do in a case of small-pox or other contagion, the rights, duties and the mode of procedure of the local officers in respect thereto, would be most desirable.

Resolved:—That the committee on quarantine and the sanitary committee jointly with the president and secretary of the Board to prepare a brief circular adapted to aid local authorities and families in the duties of domestic and internal quarantine.

The president requested the secretary to put in form such a memorandum or circular as shall best combine this resolution and the suggestions he had made concerning sanitary procedure against nuisances, etc.

The secretary called attention to the data in his possession concerning the crowded condition of school houses. He asked if some action should not be taken by the Board.

On motion it was

Resolved:—That the committee on public institutions prepare a circular to be addressed where and to whom necessary upon the subject of air-space, ventilation and lighting of school rooms.

The report of the committee on effluvia nuisances being called for, the chairman reported progress in the investigations at Manhattan Beach and on Barren Island.

The secretary referred to the importance of the State Board issuing a weekly or monthly statement of mortality and the prevailing diseases.

Annual Election:—In accordance with the requirement of section 3, of chapter 322 of 1881, the Board now proceeded to its annual election of president and the appointment of standing committees. On motion

the secretary was instructed to deposit one ballot for the president of the Board during the ensuing year, and that the ballot bear the name of Dr. E. M. Moore.

The president re-appointed the committees of last year to serve during the present year, adding the name of Commissioner Brooks to the committee on drainage, sewerage and topography.

Adjourned.

SPECIAL MEETING. ALBANY, JUNE 23.

Seven members in attendance.

The consideration of the food and drug, entitled chapter 407, laws of 1881, was taken up and the act was read through.

The duties imposed upon the Board by this law and the best means for carrying out its provisions occupied much of the time of the meeting. After discussion it was on motion,

Resolved:—That the secretary be authorized to print 1,000 copies of chapter 407, of the laws of 1881, for the use of the Board.

Resolved:—That the secretary be directed to prepare and print a circular calling attention to the provisions of chapter 407 of the laws of 1881, and inviting information and suggestions to promote the objects of this law.

After further conference in regard to the subdivision of the work among chemical experts, and the classification of the substances to be analyzed; it was on motion.

Resolved:—That the State Board of Health engage the services of competent persons to investigate the subject of existing adulterations in the articles of food and drugs and their compounds, and to inform this Board as soon as possible of the extent to which these articles are adulterated together with the best methods for the detection of the adulterations.

The various chemical experts available for this work in the State of New York and the inexpediency of going outside of the State for such help were considered.

On motion it was

Resolved:—That the following chemists be appointed in accordance with the last resolution, and that the sum of four hundred dollars be paid to each for his services when rendered:

Prof. S. A. Lattimore, Ph. D., LL. D., Rochester University; Prof. A. H. Chester, A. M., Hamilton College, Clinton; Prof. G. C. Cadwell, Ph. D., Cornell University, Ithaca; F. E. Englehardt, Ph. D., Onondaga Salt Company, Syracuse; W. H. Pitt, M. D., Buffalo; J. C. Draper, Ph. D., New York; F. Hoffmann, Ph. D., New York; E. G. Love, Ph. D., New York.

The assignments and details of this work were discussed.

On motion it was

Resolved:—That the supervision of these investigations be referred to the sanitary committee with power to arrange the details and distribute the work among the chemists and analysts employed, and to report progress made in the organization and work at the August meeting of the Board.

The question of employing inspectors to collect samples accused or

suspected of adulteration was considered. After discussion it was on motion

Resolved:—That the sanitary committee be authorized to make such arrangements as seem best for the collection of samples and the forwarding of the same to the chemical analysts for examination, at a total expense not to exceed four hundred dollars.

Resolved:—That the sanitary committee is hereby authorized to convene the analysts and inspectors for a conference at a time and place to be named by said committee, and that their necessary traveling expenses be defrayed by this Board from the fund appropriated for said bureau of chemical analysis.

The health officer asked the Board's attention to the widespread prevalence of small-pox in all of the ports and in most of the cities of Europe.

Several months ago he issued a circular letter to all owners and masters of emigrant ships, urging that all necessary sanitary regulations at the ports of departure to prevent the presence of small-pox among emigrants, should be enforced. He submitted the following:

WHEREAS, It is believed that small-pox is at the present prevailing as an epidemic in some of the ports of the British Islands and of continental Europe, and

WHEREAS, The emigration from those countries to the United States, principally through the port of New York, is at this time unprecedented, and as we recognize the fact that the incubative period of the disease is greater than that of the average passage of steamships from the ports here mentioned to ports in the United States, thus affording an opportunity for emigrants infected at the port of departure to pass our quarantine and reach interior communities before the development of the disease, therefore

Resolved:—That this Board request the National Board of Health as a necessary measure of inter-State quarantine, to appoint an inspector of emigrant trains at Buffalo and Suspension Bridge, whose duty it shall be to examine all emigrants arriving at those places.

Resolved:—That this Board respectfully recommends that the National Board of Health shall provide for such inspections at Chicago, Pittsburgh, St. Louis and Omaha, and such other points as it may deem proper, during the prevalence of small-pox as an epidemic at the ports from which emigrants embark.

The preamble and resolutions were adopted.

The president introduced the subject of miasmatic diseases, caused by the stagnant water in the Genesee Valley canal, within the limits of the city of Rochester, and suggested the propriety of the Board registering its opinion upon that point.

The secretary called attention to drainage works provided for by law along sections of the late Chemung and Genesee Valley canals, and explained the result of his observations there during the previous week, and what was needed to be done to insure satisfactory results.

The president confirmed the views expressed and suggested that inasmuch as the Board was in a measure responsible for the successful execution of the projected work, some recommendation would be necessary.

On motion it was

Resolved:—That the Board's supervision of the Chemung and Genesee

Valley canal drainage be referred to the committee on drainage, sewerage and topography, with power to engage the services of such physicians and such engineer to aid in the work as may be.

Resolved.—That this Board furnish suitable blanks, or a form of same, to be sent to the different local Boards of Health, that the health officer may make a report as required by law, of all acute and contagious diseases recognized by the health authorities of the State.

The secretary offered the following list, and promised that the schedule should be prepared and submitted to, and approved by the committee on registration and vital statistics before printing.

Malignant cholera, yellow fever, typhus fever, typhoid fever, relapsing fever, scarlet fever, puerperal fever, cerebro-spinal fever, small-pox, diphtheria, dysentery, measles.

The secretary presented a petition from citizens of New Rochelle and reported the action thereon, and also presented the resolutions adopted by the committee on effluvium nuisances on the 3rd of June, showing the policy that had been adopted, in dealing with such complaints. The course was approved.

The president called attention to the duty of the Board's issuing a notice to all towns and villages in regard to the duty of organizing their local Boards of Health.

Adjourned.

QUARTERLY MEETING, AUGUST 10 and 11.

Held at Niagara Falls.

Seven members in attendance, viz.: Drs. Moore, Delavan, Hunt, Smith, Harris, and Mr. Brooks.

The minutes of annual meeting were read and approved. Standing committees presented reports. The chairman of the sanitary committee reported, "that a meeting of the chemists appointed by the Board under chapter 407 of 1881, was held in New York July 6th, and the organization of the bureau of chemical analysts effected. He presented the printed minutes of that meeting. [See these minutes in report on chemical examination of food and drugs.] He also reported on the progress of analysis of potable water supplies, by Prof. Waller, also on Prof. Elliott's investigations of safety-tests for petroleum illuminators.

The health officer (of quarantine) reported for the committee on internal and external quarantine on the dangers to be apprehended from foreign immigration, in the introduction and dissemination of small-pox and the necessity for federal and international measures to avert the evil.

The report was accepted and ordered to be given to the press for publication.

The secretary reports the state of work in removing nuisances along the line of the abandoned canal between Havana and Horseheads; also on the line of the late Genesee Valley canal in the towns of York, Leicester, Mt. Morris, and West Sparta. He also reported progress in the investigations and counsels at Hudson city, also an inspection by the committee and its sanitary engineer at a crowded summer hotel in

Richmond county, and at New Rochelle to investigate a nuisance caused by the drainage of a large brewery.

On motion of Mr. Brooks it was

Resolved:—That the thanks of the members of the State Board of Health are hereby offered to its president, Dr. Edward M. Moore, for the able, impartial and very satisfactory manner in which he has presided over the meetings of the Board during the first year of its existence.

Dr. Delavan, from the committee on effluvium nuisances reported the inspection of two super-phosphate factories on Barren island, where extensive ponds of sludge were exposed in the open air.

After some discussion in regard to the present powers of the committee on effluvium nuisances it was

Resolved:—That the special committee on stench nuisances be directed to request the Governor to close at once the factories on Barren island which disseminate odors of sludge acid, to the discomfort of the summer resort, and to furnish the Governor the names of the said factories and of the firms operating them.

Resolved:—That the special committee on stench nuisances be directed to request the Governor to close at once all refineries and other establishments at and near Newtown creek that permit sludge acid, tar, or any other refuse to run into the creek, or on the neighboring grounds, or allow offensive odors to escape from the same, until such time as in the opinion of the committee such improvements shall have been made in the factories, as will in future prevent such offensive discharges and odors.

Resolved:—That the committee on stench nuisances be directed to furnish the Governor the names of said factories, and of the firms operating same.

On motion it was

Resolved:—That the committee is empowered to recommend to the Governor the entire supervision and closure of any factory or establishment in the vicinity of Newtown creek, from which a stench nuisance emanates to New York or Brooklyn, whether from sludge acid or other causes.

Dr. Hunt, as commissioner, and as the health officer of Utica, called attention to a nuisance in the town of Deerfield north of the Mohawk, opposite Utica, and near the New York Central railroad depot; consisting of a slaughter-house, where from putrid offal a very offensive stench arises. He had vainly called upon the local Board to abate it. He wished the aid of the State Board toward securing its abatement. On his motion it was

Resolved:—That the State Board of Health call the attention of the health authorities of the town of Deerfield to the nuisances arising from slaughter-houses and other establishments near the bank of the Mohawk river opposite the city of Utica, and request that they cause the same to be abated.

Dr. Hunt also called the attention to a nuisance caused by an outfall sewer that receives the filth of the fifth, seventh, and ninth wards, and discharges it into a ravine running through the eastern part of the city thence into the Erie canal. Much sickness, he claimed, is caused by this nuisance. The city should be compelled to conduct a sewer through the ravine, and culvert it under the Erie canal. After consideration it was, on motion

Resolved.—That in the judgment of this Board upon the facts here submitted the discharging of sewage, or other filth into the Erie canal from the eastern part of the city of Utica, and likewise the discharge of sewage into the abandoned Chenango canal, is an evil which should be prohibited and prevented, as a cause of injury to the public health.

Resolved.—That the State engineer and superintendent of public works respectively be furnished with a copy of this resolution.

The health officer of Buffalo and other citizens of that city, appeared before the Board and reported upon the Hamburg street and Erie canal nuisances of their city.

The health officer and citizens of Lockport appeared in person to report the evils suffered in their city from the stench nuisance arising from the Erie canal as it passes through that city. They showed that the people of Lockport were sufferers from the sewage of Buffalo, which was poured into the Hamburg canal. The public water supply for general purposes, domestic uses alone excepted, is derived from the canal by means of the Holly system.

The secretary submitted papers and affidavits from Hartland, Niagara county, in reference to a source of nuisance from swamp lands, alleged to be caused by overflows and spills-ways of the Erie canal, and in reference to which an appeal to the State Board had been made. Mr. Chase the supervisor of Hartland, was present to explain this matter. Mr. Chase said that he attributed the nuisance to the enlargement of the Erie canal which caused a greater overflow of water into the eighteen mile creek than its size would admit without flooding the adjacent lands, thus creating swampy and marshy grounds, which had been the occasion of much miasmatic disease. There was in his opinion but one practicable plan for remedying the evil; namely by draining the creek and enlarging its bed.

The secretary reported that the drainage works along the bed of the abandoned canal in Chemung and Schuyler counties were completed in a little more than one month (ending August 9th).

The urgent necessity for some twenty miles of drainage in and near the bed of the late Genesee Valley canal, and the conflicting proprietary interests involved was discussed, and on motion it was

Resolved.—That the Governor be informed by the committee on drainage, sewerage, and topography, of the situation of affairs in the malarial neighborhoods along the line of the late abandoned canal in the Genesee Valley; and also informed of what sections need to be immediately drained and secured against the artificial swamps in the bed of the old Genesee Valley canal, which cannot (under existing laws) be provided for under chapter 593.

The secretary next submitted petitions from citizens of Schenectady, referred by the Governor to the Board, with letters pertaining thereto, appealing for relief from nuisances caused by imperfect sewage in Cowhorn, College, and Mill creeks, in that city. He said the drainage committee had visited the place in company with two professors of engineering, and another expert engineer, who made a report thereon. The people were responsible for this condition of things. The committee was ready to report its conclusions to the Governor, as it had already communicated with the Mayor and Board of Health of Schenectady. After consideration it was, on motion,

Resolved.—That a copy of the report of the committee, as forwarded

to the Mayor and Board of Health of Schenectady, be sent to the Governor, and that the Governor be further informed that, in the judgment of this Board, it is the duty of the people of Schenectady to proceed at once to the abatement and prevention of this nuisance.

The Board of Health of Spencerport submitted a petition from residents of that village in regard to the condition of the pond and adjacent swamp lands within village limits. It was one of many nuisances with which the Board would have to deal promptly.

The secretary also called attention to the petitions from Piffardinia, Livingston county, and to the need for engineering service there, and southward, in the towns of York and Leicester. On motion, it was

Resolved :—That Mr. Kuichling, civil engineer, be requested to visit York and Leicester, to give some immediate advice to the local Boards of Health, with a view to the removal of the causes of malaria, concerning which they had appealed to the State Board.

The duty of local authorities acting for themselves upon their own orders in regard to the removal of nuisances was discussed.

On motion, it was

Resolved :—That the secretary of the Board be directed in all cases of complaint of bad drainage, sewage, ventilation, or sickness, caused by the neglect of the local authorities and people, to provide for the health of their own citizens, to inform the local Boards of Health, trustees, supervisors, town clerks, and other officers, that the first duty of cities, villages, and towns, is to adopt measures for their own comfort and safety, and that the State Board of Health, thereon, will offer all the aid and support which it is permitted to give under the laws of the State.

The prevalence of malaria and the importance of collecting information on the subject was discussed.

On motion it was

Resolved :—That the committee on registration and vital statistics be directed to prepare a series of questions with regard to the prevalence of malaria to be sent to the local Boards of Health.

Resolved :—That an additional sum of \$150 be appropriated to complete the investigation of apparatus for most accurately determining the safety standard flash-test of petroleum.

Resolved :—That the sum of \$400, or so much as may be necessary, be added to cover the expenses of inspection in the collection of samples, in carrying out the provisions of chapter 407, laws of 1881.

Resolved :—That the secretary be authorized to print for the use of the Board, the prepared list of authorities on the adulteration of food and drugs.

The secretary presented a special statement and report on systematic vaccination, and the Board's duty in regard to it, as yesterday requested by the president of the Board. [See the report in the appendix.]

After discussion it was

Resolved :—That this Board recommends the establishment by the State of a "Vaccine Farm," under the supervision of the State Board of Health, for the production and maintenance of pure vaccine virus, for gratuitous distribution to all local health authorities, public institutions and schools in this State, and that such action as will be necessary to secure this result be referred to the sanitary committee, the committee on external and internal quarantine, and the committee on registration and vital statistics.

Prof. Stephen Smith, the Board's delegate to the Chicago Inter-State conference, on the subject of small-pox and quarantine, held July 30, made his report. He explained the objects and results of the conference, and presented a copy of the resolutions there adopted to prevent the introduction of small-pox, and its spread throughout the country by means of immigration.

On motion it was

Resolved:—That the thanks of this Board be tendered to Professor Stephen Smith, for his able representation of the New York State Board of Health at the Inter-State sanitary conference at Chicago.

Further discussion on the need for repressive measures to prevent the introduction and dissemination of small-pox ensued.

On motion it was

Resolved:—That the New York State Board of Health will co-operate to the full extent of its power with the National, State and local authorities for the prevention of the introduction of small-pox into this country by immigration; its spread from one State to another; and its extinction wherever it exists in the State—through a systematic plan of general vaccination.

Resolved:—That in view of the epidemic form of small-pox in many ports and countries in Continental Europe, Canada and the British Isles, the National Board of Health is respectfully requested to secure the vaccination of all unprotected immigrants, within twenty-four hours after leaving the port of departure, and a prompt vaccination or re-vaccination, at the port of arrival, of all persons not thus protected against small-pox.

The subject of the sanitary condition and needs of school-houses which had been entrusted to the standing committee on public institutions at the last quarterly meeting, and the preparation of a circular ordered, being brought forward it was

Resolved:—That the committee on public institutions be authorized to use its discretion in obtaining such architectural counsel as may be necessary in preparing its report for use in the second annual report of the Board, at a cost not to exceed two hundred dollars.

Mr. Brooks called attention to the propriety of the Board giving expression to its sentiments concerning the assassination of the President, at this, its first meeting since that terrible crime. On his motion, seconded by Dr. Delavan, the following preamble and resolutions were unanimously adopted:

WHEREAS, The State Board of Health, of New York, in sincere sympathy with the President of the United States, in his prolonged sufferings, has heard, with great satisfaction, of the daily improvement in his condition, therefore,

Resolved: That holding in utter abhorrence the crime committed against the President, and the motive of this crime, it becomes the duty of every citizen who would maintain the permanence and integrity of the government to discountenance all like offenses, and to secure, as far as possible, the just punishment of all violations of law, whether committed against persons in official places, or against the institutions of the country necessary for its preservation,

Resolved:—That a copy of this preamble and resolutions be sent to the President under the official seal of the Board.

Adjourned.

LAST QUARTERLY MEETING IN 1881.

ALBANY, November 9.

Present—Dr. E. M. Moore, *President*, Erastus Brooks, Dr. J. Savage Delavan, Dr. Wm. M. Smith, Dr. James G. Hunt, and Dr. E. Harris, *Secretary*.

The reports of the standing committees were presented as follows: The executive and finance committee reported that on the first of October a small balance was remaining from the first appropriation, the total amount expended, in sixteen months, being a little over \$14,000, and that in November the new appropriation began to be drawn upon.

The chairman of the committee submitted a statement of appropriations needed for the support of the Board's work during the fiscal year commencing October 1st, 1882.

The sanitary committee submitted a report from A. H. Elliott, Ph. D., on the safety-test of petroleum illuminators, and suggested that the report be returned to him for completion before December 15th.

Resolved, That the Board hold a special meeting on Friday, December 9th, at its central office, Albany, to consider the various contributions appended to the annual report.

The sanitary committee submitted a copy of the printed regulations adopted by the health department of the city of New York, relating to domestic drainage and plumbing, and asked that with Prof. Gardiner's approval the State Board should adopt and promulgate the same.

It was

Resolved.—That the regulations adopted by the health department of the city of New York relating to domestic drainage and plumbing be referred to the standing committee on drainage, sewerage and topography with power to revise and prepare additions or amendments of such revised pamphlet to be submitted to the Board.

The committee on vital statistics reported progress made.

The chairman of the committee on public institutions, said he was not prepared to make a final report.

A report of the committee on drainage, sewerage and topography was presented.

The president reported the results of his investigation of the Eighteen-mile creek in Hartland. He submitted a series of affidavits bearing on the subject. He found the medical men of the district do not sustain the position taken by the petitioners.

The committee on effluvium nuisances submitted a report on the present aspect of the nuisances at Hunter's Point.

On motion it was

Resolved.—That the special committee on effluvium nuisances be requested to prepare a complete report of its labors to be incorporated in the annual report.

The health officer, Dr. Smith, called attention to the evidence that tanks of the sludge, or spent acid, had been dumped at and near the Narrows, or that the stuff had floated around there from Jersey side, creating an intolerable nuisance to inhabitants on the shores of the bay. On his motion it was

Resolved.—That the committee continue its work as a committee of observation, with power to employ inspectors for such localities as have been, or may be, employed in the commission of such nuisances.

On motion it was

Resolved:—That the State Board of Health of the State of New York, again make an earnest request to the Board of Health of the State of New Jersey for the removal of the nuisances growing out of the manufactories on the Kill-Von-Kull opposite to the shores of Staten Island, producing, as they do, most offensive smoke and smells, and at times, the flowing of sludge into the waters which separate Staten Island from the State of New Jersey.

Resolved:—That the committee on effluvium nuisances be the special committee to wait upon the Governor and Board of Health of the State of New Jersey to represent the condition of things as affecting the inhabitants and waters of the bay.

Resolved:—That the services of Dr. Lincoln be retained until the first of January at the same rate of compensation as he has received.

Inspector Colby submitted a package of coffee mixture which he had found being sold in open market under the name "of Board of Health Coffee."

On motion it was

Resolved:—That the secretary be requested to notify the manufacturers of "Wright, Gillies and Brothers," "Board of Health Coffee," of the offensive and unauthorized use of the name on their "coffee packages."

The secretary called attention to the former action of the Board in reference to the establishment of a vaccine farm and the many calls that had been made for virus from local Boards of Health, the payment for which the State Board had guaranteed to the various persons who supplied. After further discussion it was

Resolved:—That the subject of a vaccine farm be recommitted to the three committees already named with power to prepare a bill to be submitted to the Legislature.

Attention was called to the petition from New Rochelle under investigation by the Board and the progress made therein. On motion it was

Resolved:—That the committee on drainage, sewerage and topography be hereby directed to make a report as soon as practicable on the removal and prevention of the nuisances complained of at New Rochelle which was referred to this Board by the Governor, and that the committee be authorized to employ an engineering expert to examine and report upon said nuisance.

The secretary called attention to numerous complaints and petitions in regard to swamps along the line of the Erie canal and the necessity for some report being made upon them immediately. The absence of Prof. Gardiner, chairman of the committee, in Europe, had been the chief cause of delay.

After consideration it was

Resolved:—That the various papers referred by the Governor to the Board be immediately submitted to the committee on drainage, sewerage and topography with instructions to make all necessary investigations and report directly to the Governor.

The following resolution was submitted and adopted:

Resolved:—That the president, Dr. Edward M. Moore, be authorized to represent the Board at the meeting of the American Public Health Association to be held at Savannah on the 29th of November.

Also on motion it was

Resolved:—That Hon Erastus Brooks be added to the delegation

from this Board to the meeting of the American Public Health Association.

Resolved.—That Dr. Chandler be authorized to retain the services of only those inspectors that he needs, at the same rate of compensation as heretofore paid, until the next meeting of the Board.

The subject of the preparation of a bill to prevent injury to life from explosive illuminators was considered, and it was

Resolved.—That the sanitary committee and the committee on laws prepare the draft of a suitable law to be enacted for the prevention of injuries from explosive illuminating oils.

Adjourned.

ABSTRACT OF TRANSACTIONS RELATING TO SMALL-POX.

[*Supplementary to minutes.*]

As numerous records of work during the past year need to be presented in abstract in connection with the foregoing transcript of minutes, the following epitome is submitted:

Procedures for the suppression of small-pox in Washington county in December and January.—December 25, 1880, the petition of inhabitants of the hamlet of Shushan, in Salem, required a prompt decision in support of the quarantine that was being enforced by the Salem Board of Health. The health officer was urged to unite all the physicians of the town in the duty of vaccinating from house to house, as well as among their own patrons, and to aid this the State Board guaranteed the payment of certain quantities of fresh vaccine virus. The quarantine requirements were not relaxed until the whole population had been protected.

Small-pox in Fremont, Sullivan county.—On the 30th of January notice was received from the town clerk of Fremont, the south-western town in Sullivan county, that small-pox was spreading in a certain school district of that town, and in answer to his appeal for advice and assistance for the arrest of the contagion, the secretary ordered supplies of fresh bovine virus to be sent to them. The disease subsided after about six weeks.

Small-pox at Amsterdam.—The attendance at the public school was ordered suspended late in the month of December, until the order of the vaccination should have been complied with, and the result was, happily, as shown by Mr. McClumpha's letter, the latter order had been fully complied with before the second of January, so that the school was opened on the first Monday of the new year.

Small-pox in Broadalbin.—On the 17th of February, Dr. Thorne, health officer, communicated information concerning cases of small-pox in that town, resulting from exposure in Amsterdam. The chief points in this case were that a case of varioloid, contracted from exposure to one of the Guibord cases, late in autumn, was closely quarantined, and immediately upon determining the diagnosis, vaccination was extended to all the exposed population in that town. Only one other case occurred from the exposure that had already been suffered.

Small-pox in Johnstown.—During March and April small-pox appeared among the paupers in the town, and having begun to spread in the poor-

house of the county, Dr. Beach was appointed physician. At once a barracks, or hut hospital was constructed, and complete separation of the sick from all other persons secured. Vaccination was offered by public notice to each of the schools in the town, including the villages of Gloversville and Johnstown. In the latter village the school board issued notice, according to law, appointing Dr. Wm. L. Johnson to see that the law regarding vaccination of school children was thoroughly carried into effect. Small-pox ceased entirely after a few weeks. In these Fulton county cases the State Board was consulted and its advice strictly followed.

Small-pox at Glens Falls.—On the 9th of August 1881, the secretary received information that small-pox was prevailing in a virulent way at Glens Falls. He immediately advised the Board of Health and health officer of that village, and of the town of Queensbury in which the town is situated, to enforce strict domestic quarantine and the public offering of vaccination and revaccination to all the inhabitants. On returning from the western counties the secretary was met by an urgent request to confer with the Board of Health of Queensbury and of Glens Falls, and on the 16th he made such visit. Great alarm then prevailed throughout the town of Queensbury and in the surrounding towns, and as the town Board of Health then offered to provide hospitals and attendants a mile beyond village limits, the village health officer was appointed health officer of the town, and free vaccination was offered to all classes of inhabitants in the village and town alike. Hospitals were constructed of boards and ready-made doors and windows, on a lofty, sandy plain nearly two miles west of the railway depot, half a mile from habitations, near a good well of water. Competent nurses and medical attendants were provided immediately, and all suitable places were at once occupied under orders of the village Board of Health. The first orders were resisted by wordy threats of violence against the health officers. These were harmless, however, and the health officer's orders were implicitly complied with. There were fifteen dwellings under quarantine at the hour the secretary left Glens Falls.

After a few days the capacity of the hospital as first outfitted proved insufficient, and a new one, fully equipped and well appointed, was constructed in a single night and occupied next morning. After a few days another of still better appearance and equipment was constructed in another night and occupied next morning by a worthy citizen who survived and has paid the cost of building (\$65).

Another hospital building was erected in a single day, but as the disease subsided under the control of vaccination, the last-named building was never occupied.

Small-pox in Argyle.—While small-pox was at its height in Glens Falls, a laborer, aged 23 years, came home to his brother-in-law, near the town line of Fort Edward, and was taken to his mother's, a mile from Argyle village, with virulent small-pox. Immediately the town Board of Health organized under advice of the State Board of Health under chapter 431, of 1881.

The health officer, Dr. M. L. McNeil, vaccinated and revaccinated the entire family of the small-pox patient within a few hours after his arrival home and with the result of entire protection of them all. In the course of a few days 650 persons were gratuitously vaccinated, and many more paid for their vaccination with the result that in a pop-

ulation of 2,700 not a case of small-pox had occurred excepting the one patient who died. The entire school population was reported as being well vaccinated at the time of the visit of Commissioner Brooks and the secretary on October 14, 1881.

Vaccination at Fort Edward.—As at Argyle and numerous other places that maintained almost hourly intercourse at that period with Glens Falls as a trade town, notice was given by the secretary of the Board, during the month of August, and the utmost activity in vaccination was secured. The first warning was given August sixteenth, the day of the first inspection at Glens Falls. Dr. Farley, health officer, and Rev. Dr. King, principal of the Fort Edward Institute, were urged to have vaccination complete within a week from that date. It has been ascertained since that those gentlemen and the town Board of Health, which was immediately organized, urged on this step until it was very nearly completed within a fortnight from that time. Fort Edward is six and a half miles from Glens Falls, and has hourly communication by rail and highways with the village of Glens Falls. Not a case of small-pox occurred in the village or township, and at the time of the conference with the Board of Health and Rev. Dr. King October fourteenth, Commissioner Brooks and the secretary found public opinion was conclusive that the entire population had been protected by their timely vaccination and revaccination.

Sandy Hill vaccination.—The village of Sandy Hill is but three miles from Glens Falls, and has hourly communication, day and night, with the latter. During the last half of the month of August, the Board of Health of that village became thoroughly organized and was supplied with fresh vaccine virus ordered under guarantee of the State Board of Health. One thousand two hundred and fifty points were used gratuitously by the health authorities and much more by private practitioners, scarcely any inhabitant remained unvaccinated. School children are reported to be completely protected. The secretary of the Board of Health had an interview with Commissioner Brooks and the secretary of the State Board on the fourteenth, and assured them that the entire town is well protected, and he exhibited a bill for one hundred and thirteen dollars for vaccine virus yet unpaid for, but guaranteed by the State Board of Health. He volunteered the assurance that the town Board or village Board upon meeting would order the bill paid.

REPORTS OF COMMITTEES OF THE BOARD.

REPORT OF EXECUTIVE AND FINANCE COMMITTEE.

Statement of expenditures under chapter 322, of 1880, and chapter 431, of 1881, from May 29, 1880, to September 30, 1881, including all expenditures embodied in the first annual report.

Printing and Stationery.

1880.	July 12.	E. Bender & Son, for blank books.....	\$16 00
	17.	Samuel Raynor & Co., envelopes.....	76 75
	28.	Weed, Parsons & Co., printing.....	93 50
Aug.	2.	J. J. Little, printing and electrotype plates..	372 33
	10.	F. S. Hasbrook, stationery	12 35
	10.	Argus Company, printing.....	110 75
Sep.	30.	Comptroller, bill of stationery.....	137 28
	30.	J. J. Little & Co.....	27 00
Oct.	30.	J. J. Little & Co., printing	24 50
Nov.	5.	E. Bender, stationery.....	7 75
	9.	S. Raynor & Co., stationery.....	9 00
	13.	Argus Company, printing.....	366 50
	18.	R. K. Quayle, printing....	13 00
1881.	Mar. 1.	S. Raynor & Co., stationery.....	27 91
	20.	E. H. Bender, stationery	7 20
May	14.	J. J. Little, printing	36 10
	21.	Weed, Parsons, printing.....	141 05
	25.	C. Van Benthuyzen, printing.....	132 65
July	22.	F. S. Hasbrook, stationery, letter books, etc.	15 30
Aug.	29.	Comptroller, bill of stationery.....	157 25
Sep.	30.	Weed, Parsons & Co., account	85 75
			<u>\$1,869 92</u>

Postage, Expressage and Telegraphing.

1880.	June 24.	Postage stamps.....	\$170 00
	July 8.	Postal cards.....	20 00

1880. Oct. 18.	Postage stamps	\$31 00
Nov. 23.	do	35 00
1881. Jan. 18.	do	88 00
Feb. 17.	Telegraph company	11 75
Mar. 8.	Postage stamps	100 00
April 29.	do	40 00
June 18.	do	42 00
July 29.	do	80 00
Aug. 4.	Expressage	9 05
do	Postage stamps	75 00
Sept. 17.	do	40 00
		<hr/>
		\$741 80.

Salaries and Wages.

1880. June 29.	Dr. Harris, secretary, salary from May 29th to June 30th	\$274 00
July 31.	Robert Nelson, salary as clerk from June 23d to August 1st	103 22
Aug. 2.	Dr. Elisha Harris, secretary, salary for July ..	250 00
Sept. 1.	do do August ..	250 00
	1. Robert Nelson, salary as clerk for August ...	80 00
Oct. 1.	Dr. Elisha Harris, secretary, salary for September	250 00
	1. Robert Nelson, salary as clerk for September ..	80 00
	30. Dr. Elisha Harris, secretary, salary for October	250 00
	30. Robert Nelson, salary as clerk for October ..	80 00
Nov. 24.	Dr. Elisha Harris, secretary, salary for November	250 00
Dec. 2.	Robert Nelson, salary as clerk for November ..	80 00
Jan. 3.	Dr. Elisha Harris, secretary, salary for December	250 00
	do Robert Nelson, salary as clerk for December ..	80 00
	do Robert Nelson, for night work	16 00
Feb. 1.	Dr. Elisha Harris, secretary, salary for January	250 00
	do Robert Nelson, salary as clerk for January ...	100 00
	18. Louis W. Pratt, for clerical services	60 00
Mar. 2.	Dr. Elisha Harris, secretary, salary for February	250 00
	Robert Nelson, salary as clerk for February ..	100 00
Mar. 31.	Dr. Elisha Harris, secretary, salary, March ..	250 00
	Robert Nelson, salary as clerk for March	100 00
May 2.	Dr. Elisha Harris, secretary, salary for April ..	250 00
	Robert Nelson, salary as clerk for April	100 00
June 1.	Dr. Elisha Harris, secretary, salary for May ..	250 00
	Robert Nelson, salary as clerk for May	100 00
July 1.	Dr. Elisha Harris, secretary, salary for June ..	250 00
	Robert Nelson, salary as clerk for June	100 00
Aug. 8.	Dr. Elisha Harris, secretary, salary July	250 00
	Frederick Carman, stenographer and clerk, salary for July	150 00

1880.	Aug.	8.	Robert Nelson, salary as clerk for July.....	\$100 00
	Sept.	1.	Dr. Elisha Harris, secretary, salary for August.....	250 00
		1.	Frederick Carman, stenographer and clerk, salary for August	150 00
		1.	Robert Nelson, salary as clerk for August...	100 00
		1.	Fergus Halpen, office messenger, salary August.....	12 25
	30.		Dr. Elisha Harris, secretary, salary for Sep- tember.....	250 00
	30.		Frederick Carman, stenographer and clerk, salary for September.....	150 00
	30.		Robert Nelson, salary as clerk for September.....	100 00
	30.		Fergus Halpen, office messenger, salary for September.....	15 16
	30.		John Kerr, wages for services in Hunters Point, etc.....	145 45
				<hr/>
				\$6,126 08

Expert Services.

1880.	Sept.	25.	William Packer Prentice, preparation of Manual of Public Health Laws.....	\$500 00
		25.	John C. Collins, clerical and expert services on Manual and as stenographer.....	75 00
		25.	Julius W. Adams, civil engineer.....	150 00
	Dec.	8.	Frederick Carman, stenographic and clerical services.....	49 00
1881.	Feb.	17.	Frederick Carman, stenographic and clerical services.....	7 00
		28.	Frederick Carman, stenographic and clerical services.....	73 50
	Mar.	5.	Frederick Carman, stenographic and clerical services.....	77 00
		17.	Col. G. E. Waring, Jr., services as sanitary en- gineer.....	177 77
		31.	Frederick Carman, stenographic and clerical services.....	133 00
	April	30.	Frederick Carman, stenographic and clerical services	175 00
			W. Ellery Davis, stenographic service.....	5 00
	May	27.	Prof. A. Liantard, veterinary expert.....	10 90
	June	1.	Frederick Carman, stenographic services, etc.....	168 00
		14.	W. S. Egerton, civil engineer.....	22 05
	July	7.	Frederick Carman, stenographic and clerical services	150 00
	Aug.	4.	Emil Kuichling, C. E.....	50 53
		4.	Thomas Nealis, sanitary engineer.....	10 00
		31.	J. J. R. Croes, C. E.....	55 25
	Sept.	2.	Emil Kuichling, C. E... ..	61 73
		5.	Egbert Bagg, C. E.....	14 12
		6.	Elwyn Waller, Ph. D., for water analysis....	161 95
		12.	A. H. Elliot, for petroleum testing and in- vestigations	155 00

1881. Sept. 16.	P. Hogan, civil engineer.....	\$49 90
	Elwyn Waller, Ph. D., for report on sludge..	50 00
	Albert L. Colby, Ph. B., " " ..	20 46
	W. S. Egerton C. E.....	27 85
		<hr/>
		\$2,430 01

Library, Books, Maps and Charts.

1881. May 14.	W. C. Little, for books	\$65 50
June, 18.	Dr. Harris, for sundry purchases	31 15
		<hr/>
		\$96 65

Furniture.

1880. July 17.	Press and stand.....	\$22 95
21.	F. S. Hasbrook, furniture.....	57 59
Aug. 3.	Seal and seal press.....	30 00
16.	Plate note heading.....	30 00
Nov. 10.	2 ash tripods for maps	7 00
1881. June 24.	Oak registry cabinet and table	60 00
July 16.	Whitney & Co., matting and office goods....	28 35
22.	Matting	12 13
		<hr/>
		\$248 02

Investigation of Disease.

1881. Feb. 17.	Various expenses incurred while investigating diseases in various places in September, October and November, 1880, per account.	\$274 64
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Traveling and other Necessary Expenses of Members of the Board while on Duty.

1880. July 13.	Dr. E. M. Moore, expenses	\$49 74
17.	Dr. J. S. Delavan, do	30 59
Aug. 2.	Dr. J. G. Hunt, do	53 02
3.	Chas. F. Chandler, do	42 00
11.	Erastus Brooks, do	46 85
11.	Dr. M. Smith, do	9 60
	Dr. Elisha Harris, do	98 35
Sept. 25.	Hamilton Ward, do	20 30
30.	Dr. J. S. Delavan, do	16 50
Oct. 13.	Jas. T. Gardiner, do	16 50
Dec. 2.	Erastus Brooks, do	18 54
Dec. 4.	Dr. J. S. Delavan, do	19 20
	Jas. T. Gardiner, do	16 45
1881. Jan. 3.	Erastus Brooks, do	101 25
5.	Dr. E. Harris, do	82 00
7.	Dr. E. M. Moore, do	60 98
Feb. 17.	Dr. J. S. Delavan, do	8 65
17.	Dr. Wm. M. Smith, do	30 15
Mar. 31.	Dr. Jas. G. Hunt, do	90 05

1881.	Mar. 31.	Dr. J. S. Delavan, expenses.....	\$42 38
	May 14.	Dr. E. Harris, do	173 05
	19.	Dr. E. M. Moore, do	34 17
	19.	Dr. J. S. Delavan, do	26 90
	21.	Erastus Brooks, do	35 75
	June 18.	Dr. E. Harris, do	185 61
	July 27.	Dr. J. S. Delavan, do	31 20
	27.	Dr. Elisha Harris, do	74 93
	Aug. 3.	Dr. E. M. Moore, do	18 05
	8.	Dr. Wm. M. Smith, do	27 30
	30.	Erastus Brooks, do	51 62
	Sept. 1.	Dr. J. S. Delavan, do	54 32
	1.	Dr. J. G. Hunt, do	69 31
	Sept. 7.	Dr. Wm. M. Smith, do	25 75
	24.	Dr. E. Harris, do	271 14
			<hr/>
			\$1,932 20

Miscellaneous Expenses at Central Office paid by the Secretary.

1880.	Aug. 10.	Expenses.....	\$28 90
1881.	April	do	208 04
	May 14.	do	30 00
	June 18.	do	5 57
			<hr/>
			\$272 51
			<hr/>
Grand Total.....			\$13,991 83
Balance in Treasury.....			1,008 17
			<hr/>
			\$15,000 00

The foregoing report comprises all the expenditures of the Board, in general and detail (except three bills for printing and expert service not yet presented the total of which is not in excess of the appropriation) from its organization in May 1880 to September 30, 1881, a period of sixteen months.

The expenditures of the Board for the ensuing year will be kept strictly within the amount appropriated for the purpose, and the committee, as advised by the Board, respectfully suggests that the Legislature may, with advantage to the State, authorize the expenditure of five thousand dollars in addition to the sum of five thousand dollars allowed by law for sanitary surveys, inspections and expert duties, which are now and will be required for successful work, and which the State should provide for in addition to the necessary work of local Boards of Health.

ERASTUS BROOKS, *Chairman.*

CHARLES F. CHANDLER.

EDWARD M. MOORE, *President.*

ELISHA HARRIS, *Secretary.*

*Executive and Finance
Committee.*

Statement of expenditures under chap. 407, of 1881, from July 5th to
December 31, 1881.

Traveling and Incidental Expenses of Chemists and Examiners.

1881. July	6.	Dr. S. A. Lattimore, per itemized acct. rendered..	\$26 64
	6.	Dr. W. H. Pitt, do ..	26 60
Aug.	10.	F. E. Englehardt, do ..	21 39
	10.	Dr. E. G. Love, do ..	23 50
	12.	A. H. Chester, do ..	14 68
	30.	A. L. Colby, do ..	23 77
	30.	Dr. DeLap Smith, do ..	28 81
	31.	C. E. Munsell, do ..	14 75
	31.	G. C. Caldwell, do ..	27 56
Sept.	30.	C. E. Munsell, do ..	4 00
	30.	A. L. Colby, do ..	2 55
	30.	Cataract House, do ..	49 00
	30.	Dr. DeLap Smith, do ..	24 08
	30.	Dr. W. H. Pitt, do ..	7 25
	30.	Dr. S. A. Lattimore, do ..	3 18
Nov.	2.	A. L. Colby, do ..	2 82
	10.	C. E. Munsell, do ..	61 50
	18.	Dr. DeLap Smith, do ..	37 08
	30.	Dr. W. H. Pitt, do ..	21 55
Dec.	2.	A. L. Colby, do ..	10 39
	3.	Dr. S. A. Lattimore, do ..	22 27
	3.	do do ..	20 05
	9.	Dr. DeLap Smith, do ..	48 98
	31.	A. L. Colby, do ..	71
			<hr/>
			\$523 11

Compensation of Inspectors.

July	30.	A. L. Colby, for July.....	\$43 50
Aug.	30.	do August.....	50 00
	31.	Dr. DeLap Smith, for July and August.....	93 56
	31.	C. E. Munsell, for do	93 50
Sept.	30.	C. E. Munsell, for September.....	50 00
	30.	A. L. Colby, do	50 00
	30.	Dr. DeLap Smith, do	50 00
Oct.	30.	A. L. Colby, for October.....	50 00
	30.	C. E. Munsell, do	50 00
	30.	Dr. DeLap Smith, do	50 00
Nov.	30.	A. L. Colby, for November.....	50 00
	30.	C. E. Munsell, do	50 00
	30.	Dr. DeLap Smith, do	50 00
Dec.	31.	A. L. Colby.....	50 00
			<hr/>
			\$780 56

Printing and Stationery.

1881.	July	7.	J. W. Wadsworth, comptroller, stationery....	\$46	93
		7.	do do letter book ..	3	25
	Sept.	1.	E. Ellis, for blank books.....	7	50
		30.	A. L. Colby, stationery, per account.....		60
		30.	Dr. DeLap Smith, do do		50
	Dec.	15.	J. W. Wadsworth, comptroller, stationery....	15	50
		16.	Type writing, per account of Mrs. B. A. Rushton.....	2	25
				<hr/> \$76 53 <hr/>	

Purchases of Samples for Analysis.

July	30.	A. L. Colby,	per account,	\$5	79
Aug.	30.	do	do	5	61
Sept.	4.	G. W. Banker,	do	26	84
	30.	A. L. Colby,	do	40	47
	30.	Whitall, Tatum & Co., (Apparatus)	do	136	28
	30.	do do	do	63	84
	30.	Dr. DeLap Smith,	do	5	98
	30.	A. L. Colby,	do	26	22
	30.	Dr. DeLap Smith	do	23	34
	30.	A. L. Colby,	do	26	93
	30.	Dr. S. A. Lattimore,	do	4	39
	30.	Dr. DeLap Smith,	do	25	12
	30.	C. E. Munsell,	do	3	45
	30.	Dr. Chandler, per account of Hastings & Hahn.		3	90
	30.	do do Whitall & Tatum (Apparatus).....		4	54
	30.	A. L. Colby, per account.....		6	33
				<hr/> \$409 03 <hr/>	

Library and Literature for Chemists and the Board.

1881.	Oct.	8.	Westermann, per account.....	\$	9 67
		8.	do do		22 19
		8.	do do		32 71
				<hr/> \$64 57 <hr/>	

Postage, Expressage and Telegrams.

1881.	July	30.	A. L. Colby,	per account.....	\$	30
	Aug.	30.	do	do		2 10
	Sept.	30.	do	do		10 50
		30.	Dr. DeLap Smith,	do		3 34
		30.	Dr. S. A. Lattimore,	do		78
	Nov.	2.	A. L. Colby,	do		8 86
		10.	C. E. Munsell,	do		50

1881. Nov. 18.	Dr. DeLap Smith, per account	.....	\$2 19
18.	do do	.....	1 60
18.	do do	.....	70
Dec. 2.	A. L. Colby, do	.....	7 86
9.	Dr. DeLap Smith, do	.....	3 04
16.	do do	.....	2 05
31.	A. L. Colby, do	.....	2 77
			<hr/>
			\$46 59
			<hr/>

Recapitulation.

Travelling and incidental expenses.....	\$523 11
Compensation of inspectors.....	780 56
Printing and stationery.....	76 53
Purchases of samples for analysis.....	409 03
Library and literature for chemists.....	64 57
Postage, expressage and telegrams.....	46 59
<hr/>	
Total expenditures.....	\$1,900 39
<hr/>	
Total unexpended.....	\$8,099 61
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GENERAL ABSTRACT.

Total payments (on itemized accounts) by Comptroller's warrants.....	\$1,516 51
Total payments out of \$700 advanced by Comptroller, August 29, 1881.....	383 88
<hr/>	
Total.....	\$1,900 39

Liabilities to 31st December, 1881.

For payments to eight chemists under contracts...	\$3,200 00
For compensation and traveling expenses of two inspectors for month of December, printing, etc., not exceeding.....	200 00
<hr/>	
	3,400 00
<hr/>	
Total payments and liabilities.....	\$5,300 39
<hr/>	
Remaining unexpended (of appropriation by Chapter 407), after all outstanding obligations are paid, to January 1, 1882.....	\$4,699 61
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ERASTUS BROOKS, *Chairman.*
 C. F. CHANDLER.
 EDWARD M. MOORE, *President.*
 ELISHA HARRIS, *Secretary.*

} *Executive and Finance
 Committee.*

REPORT OF THE STANDING COMMITTEE ON REGISTRATION AND VITAL STATISTICS.

To the State Board of Health:

Your committee in reviewing the results of its labors during the past year recognized the fact that the particular portion of duty entrusted to its supervision is of necessity a branch of sanitary reform, somewhat difficult to introduce and perfect in all its details. In the progress already made, however, and in the increasing frequency of reports and statistical information received at the Bureau of Vital Statistics, from all parts of our State, your committee hope to show that the anticipations expressed in its first report are in progress of realization; that the seed sown is already ripening; and that harvest is near at hand.

The labor of establishing a perfected and uniform system of registration of the vital movement of five millions of people, composed of all nationalities, and yearly increased by the great and never-ceasing flood of immigration that is constantly flowing in upon us through the great seaport of the Empire State, seems a task indeed; and when it is considered that every human life that forms an atom of the millions of breathing humanity existing in our vast commonwealth, has a history which, commencing at the cradle, rolls onward until the grave receives it, and that each event of every life may be of infinite importance both to the individual and its descendants, as well as contribute to the well-being of the State, the indispensability of vital registration, not only as a sanitary necessity, but also as a principle of political economy, must be admitted by every thoughtful mind.

Our statutes provide for the registration of the lands and property owned by each one of the five millions of its people, and even for those who, living beyond our boundaries, hold estate within this commonwealth. Books of public record are kept in every town and city in our State,—open to all,—setting forth, in minutest detail, the history of each parcel of land, and of each building upon its surface. Thousands of expert hands and minds are daily employed in making, keeping and preserving such records with mathematical precision; but yet how strange it seems that until recently the history of the life of the individual has been utterly ignored by the rulers of the people. If it is of such moment to the welfare of the State, that property should be registered, how much more does it concern the interests of society that the vital movement of those who own and improve such property should be equally well understood. The necessity of such correct understanding of the vital records of the race first originated in the minds of thinking men and women; the idea of State Boards of Health, correct and uniform registration not having obtained before their organization.

Previous to the appointment of the State Board of Health of New York, the State had no system of registration of vital statistics excepting in six of her cities. In many towns some attempts had been made to register births and deaths; but as no uniformity had been observed in the carrying out of the plan, the results were meagre and unsatisfactory. In the first report of your committee allusion was made to the importance of a uniform system of registering the three great events in human life,—birth, marriage, death,—as well as the recording with accuracy those diseases which yearly make up the death rate among the people. During the year that is past, every city, town and village in the State has received ample instructions together with concise forms, not only for the registration of the vital movement of the people, and the proper preservation of such records; but also simple practical methods for the recording of those diseases which have prevailed in their respective localities. Thus in eighteen months, nine hundred and forty-seven towns, three hundred and twenty-six incorporated villages and eighteen cities have been provided with methods for vital registration through the means adopted by the State Board of Health of New York. The results thus far secured have been gratifying, and have exceeded the most sanguine hopes of the committee. The number of correctly worded and properly attested certificates of Births, Marriages and Deaths, from all parts of our State that are being daily received at the State Bureau of Vital Statistics, which will be seen by reference to the following pages of the report, show conclusively that not only are the officials themselves, but also the people deeply interested and heartily alive to the importance of this sanitary measure.

Your committee, therefore, feels justified in reporting that at the end of this, the second year of the existence of the Board, the State of New York is provided with, and has adopted, a uniform system of vital registration.

Investigation of Prevalent Diseases.—As regards the investigation of prevalent diseases, much important knowledge has been gained. The reports on epidemic and prevalent diseases herewith presented, with concise memoranda as to the inception and progress of these maladies, accompanied, in many cases, by maps of the infected districts (for the most part voluntarily given) show conclusively the growing interest taken by the town and city officials, by the medical profession, and by the people in general, in aiding the committee in its labors for preventing the spread of diseases, and preserving health and life in the community. The committee believes that this its second report will show that, while laboring, as it has done, under many difficulties, and with inadequate laws to sustain its action, the work commenced is progressing most favorably, and that the State of New York in the near future will exhibit a system of recording the vital movement of its population, inferior to none in the civilized world.

The organization of local Boards, where none had heretofore existed, and the prompt and ready response made to the suggestions of the superintendent of vital statistics as to the administration of health laws, have been the great factors in the carrying out of the committee's designs. Wherever the efficient local Board exists, returns come promptly, and satisfactory information with regard to existing diseases has been obtained. Over a large portion of the State well-organized and scientific Boards of Health are now at work, and their number is rapidly increas-

ing. Epidemics of diphtheria, small-pox and other domestic pestilences have been met and conquered by their faithful labors.

The records of the State Bureau, which are open to all, show what organized and united effort has already accomplished ; and when, as seems certain to your committee, each town and city in our State are working together on one uniform basis for the prevention of the avoidable causes of disease ; when, finally, not only the State, but the National Board of Health, of which the local Boards are units, all combine in the much needed reform to which your committee has devoted its attention, then the great problem of the prevention of disease will have been solved, and the people of our land will appreciate the benefits of a uniform, exact and complete registration of all human lives in each commonwealth and in the Nation.

Respectfully submitted,

J. SAVAGE DELAVAN, *Chairman.*

RECORDS AND INVESTIGATIONS OF PREVALENT DISEASES.

AN ABSTRACT BY THE SECRETARY.

The law which created the State Board of Health and defined its duties having required that the Board shall have the supervision of the registration of vital statistics and of prevalent diseases, the duty of conducting this branch of its work has been assigned to the standing committee on registration and vital statistics. With simple forms for facilitating the preparation of records for registration and especially for the records of diseases, there is now accumulating a mass of well-attested facts and information. Voluntary and promiscuous contributions of information and correct observation relating to prevalent diseases are offered on every hand, but these are seldom comparable and ready for such practical uses as the best interests of the public health and sanitary knowledge require. The law for the better organization of local Boards of Health has conferred upon every such board the obligatory supervising of the registration of diseases and deaths, and as each board, under this new law, is required to have a competent physician as its health officer, the work of organizing the registration of prevalent diseases in any adequate measure, necessarily awaits the creation and working of the local Boards of Health, and these under the law of 1881, are becoming sufficiently well organized to warrant the use of the records they contribute. Thus far, that is, to the close of this year's report, the brief accounts of prevalent diseases presented by the committee on registration in the manner which here follows, have been especially useful in the work of the Board, and they are instructive to the people, because they consist of brief narratives of the circumstances and evidences of the operation of preventable causes and of results

of preventive and controlling sanitary measures. For this purpose the few records which here follow are submitted by this committee.

Small-pox as it has prevailed during the year 1881.—At the close of the Board's first annual report in December, 1880, numerous instances were quoted which showed the manner, and something of the extent of this diffusion of small-pox in the city of Troy and some other places in the State. The following are among the more notable instances of its prevalence during the year 1881.

Small-pox in Fremont, Sullivan County.—On the 31st of December, 1880, a patient who had recovered from small-pox was discharged from the small-pox hospital on Blackwell's Island, taking with him when he left the slippers which he had brought to the hospital with him and had there worn. The physician in charge of that hospital testifies that the patient did this in violation of orders from him. The doctor adds in his report: "Before leaving he took a bath and was then sent to the dressing room, where he was given the new underclothing which he had not before been allowed to touch. After dressing he was not permitted to return to his room, or to come in contact with any of the patients. All of the usual precautions were taken with his clothing such as fumigation with sulphur and subsequent exposure to the air." This discharged patient went directly by the Erie railroad to Fremont, the southwestern town of Sullivan county, where in the course of three weeks the contagion was found to be spreading from family to family. It was successfully combatted by vaccination, but not until after six deaths had occurred as mentioned in the Board's report.

Small-pox in Caroga and the region bordering on Hamilton County.—Small-pox was introduced, vaccination was publicly offered, and the town Board of Health of Caroga organized its duties promptly upon the written request of the State Board of Health. The contagion was quickly exterminated. It was also introduced into the village of Northville, Fulton county, where the directions of the State Board were promptly carried into effect, and the necessary means for vaccination supplied.

SMALL-POX IN THE POOR-HOUSE OF FULTON COUNTY, AND AS SPREAD FROM IT.

I have the honor to report for the information and use of the State Board of Health, the following cases of small-pox, eleven in all, which occurred in this vicinity and under my immediate observation, in April, May, and June of the current year, giving a brief history of their origin, so far as known, and a record of their termination; also a short statement of the measures taken to prevent the spread of the disease.

Suttle P., a resident of Johnstown village, and a boarder at the Harden House in that village, some time about the middle of April had a peculiar eruption, which excited so much suspicion that he was unable to obtain board in Johnstown. He was admitted as a private boarder into the Fulton county poor-house, it being represented to the superintendent that three physicians had pronounced the eruption to be non-variolaous. The date of his admission was April 18th. His eruption, by infecting several inmates of the poor-house, proved itself to be variolaous.

It is said that while boarding at the Harden House, in Johnstown,

and while he was at his business during the day, his room at the hotel was used by certain parties, one of whom was a prostitute from Fultonville, who had recently recovered from small-pox. Hence the origin of his disease. During the whole course of the eruption, he suffered neither sickness, uneasiness, nor loss of appetite; and, until the nature of his eruption was proven by its works, he took his meals regularly at the private table of the superintendent. None of the superintendent's family of seven persons contracted the disease.

The second case in my list is Hall, an inmate of the poor-house, who roomed with Suttle. He was attacked April 29th, and died May 10th of confluent small-pox.

The third case is Mrs. Ferguson, an inmate of the poor-house. She washed clothing for Suttle before the nature of his disease was discovered. She had a mild attack of varioloid.

The fourth case is George Grant, a colored boy, who, during an attack of hematuria, had been an inmate of the poor-house, and had also roomed with Suttle. He was discharged cured of his first sickness, about April 23d, and went to Perth, in this county, to work on a farm. On May 5th he was returned to the poor-house with an eruption, which was at once recognized. It proved to be small-pox, and after a tedious illness he eventually recovered.

The fifth case is James Lancaster, an imbecile, also an inmate of the poor-house, and a room-mate of Suttle. He had varioloid mildly.

The sixth case was discovered in the village of Gloversville, in the person of Robert McGuire, who was an inmate of the poor-house at the time of Suttle's admission, and occupied the same room with him. Afterward he had found work in Gloversville. As soon as discovered, he was returned to the poor-house, where he died of the hemorrhagic variety of small-pox.

The seventh case is Mary ———, a Swede, who was doing housework in a private family in the village of Kingsboro, one mile from Gloversville, and two miles from the poor-house. The origin of this case is somewhat obscure. She arrived in New York from Europe last fall; spent the winter in New York city, and had been in Kingston but a few weeks. It was impossible to learn if she had in her possession any infected clothing.

The eighth case is John Tuttle, who died of hemorrhagic small-pox. How he was exposed is not certainly known, but it is known that he visited Johnstown while small-pox was epidemic in that village. He was a farm laborer, living and laboring some four miles from Gloversville, and two miles from the poor-house. He died in his own house of two apartments, in the midst of his family of wife and five or six children, who were all immediately vaccinated and escaped the disease.

The ninth case is Mrs. Herrington who also died of hemorrhagic small-pox. She was first discovered in a filthy hovel destitute of furniture, lying naked on a pile of straw, with the eruption well marked and already hemorrhagic, with a babe at her breast. The baby was immediately vaccinated and escaped the disease. The mother was removed to the Gloversville hospital where she could have proper care, but she succumbed. It is not known how she became infected. She had been employed as a domestic on the same farm where Tuttle was employed as a laborer. She was a prostitute and may have met with exposure as a consequence.

The tenth case is Dr. John E. Burdick, of Rockwood, who had varioloid in a very mild form. He probably contracted the disease from a patient whom he attended.

The eleventh case is Maggie Ward, aged fifteen, who had varioloid but a few weeks after her successful vaccination. The origin of this case is involved in utter obscurity, unless a somewhat improbable story which she told be true, which would point to infected materials as the source of infection. She resided three miles from Gloversville and one mile from the poor-house. She was removed to the Gloversville hospital.

During this epidemic all persons known to have been exposed to small-pox were vaccinated and placed in quarantine. Suitable buildings were erected on the poor-house farm, where infected paupers were treated. They were cared for in a building separately erected by the authorities of Gloversville. Dr. Burdick also had one erected for his own occupancy and one patient died at his dwelling. All infected places were thoroughly disinfected by sulphur fumigation and infected articles were either burned or thoroughly disinfected. Too favorable mention cannot be made of the untiring efforts of Dr. F. W. Shaffer of Gloversville, the faithful, intelligent and efficient health officer of the town of Johnstown, to which in a great measure is due the limiting and final extinction of the disease.

Respectfully submitted by

EUGENE BEACH,

Health Officer of Gloversville and Physician to Fulton County Poor-House.

Dr. Beach's report shows that there were twelve cases and four deaths.

SMALL-POX AT JOHNSTOWN, FULTON CO.

Report by the Health Officer.

A brief report in relation to the small-pox epidemic, that visited the village of Johnstown during the spring of 1881, is here submitted to the State Board of Health, and others interested in the public safety, as illustrating the importance of strict sanitary measures being instituted at the very first appearance of the disease, a thorough isolation of infected persons and a rigid quarantining of cases of modified small-pox or varioloid (cases so mild as to be scarcely recognizable). It was owing largely to a case of this nature that small-pox was spread through our community. At the outbreak of the epidemic there was no regularly organized and constituted Health Board in the town. The village trustees were acting in capacity of Board of Health, but they were without a health officer. This disadvantage, together with too great fear and cowardice manifested by the citizens, rendered concerted action difficult, and the efforts of the Trustees to stay the disease was made to some extent ineffective.

The first case of small-pox occurred in the family of David Smith, residing corner of Market and Green streets, in the person of his son Louis, who doubtless contracted the disease while on a tour to Washington, at the inauguration of President Garfield, March 4th. The symptoms of disease were first manifested March 15th, and small-pox was suspected, when other members of the family, five in number, were removed from the premises and the house was quarantined and such

precautionary measures taken as was thought would insure against further spread of the disease. But contrary to expectation, April 4th, Mrs. Nelson Fairchild, who with her husband were boarding in the family of Mr. Hillock, on Green street, two doors east of the Smith residence, was reported to have small-pox. The Hillock family, three in number, were removed, and Mrs. and Mr. F. were quarantined in house where she was taken sick. Mrs. F. was enceinte; had a miscarriage, followed by hemorrhage, and died April 20th. The theory of her infection was from fomites conveyed in the air from Smith's. Oliver Hays resided on West State street, and was taken sick April 13th; reported to have small-pox, April 16th. His wife and children were vaccinated and the children isolated as much as possible, although not removed from home. Hays died April 24th. The source of infection is obscure.

The next case, the most obscure of all that occurred, both as regards manner of infection as well as nature of the disease, and the most mischievous case of all, was that of Parker Settle, a bachelor, aged about 50. Settle boarded at the Harden House, a hotel, corner Main and Perry streets; he was an epileptic, was taken with a seizure April 15th, but emerged from fit in about the usual time, felt, however, more prostration than was usual after similar attacks, which continued for two or three days, when a few isolated papules appeared on his face. This gave rise to some alarm on the part of the frequenters at the hotel, and Settle was induced to consult a physician, which resulted in his being pronounced free from small-pox. This assurance did not, however, quell the public fear, and Settle became a terror to those with whom he came in contact, and was finally driven from his boarding house and rejected by all others, consequently was forced to appeal to the authorities who sent him to the alms-house. After two weeks sojourn here, two cases of small-pox were reported and suspicion at once fastened upon Settle as the source of the contagion. This suspicion, no doubt, was well founded, as the poor-house was four miles from the village of Johnstown, and there was no other way for the disease to originate. Dr. Eugene Beach, health officer for the village of Gloversville, had charge of the cases that occurred here and will, doubtless, report them to the State Board of Health. The last three cases mentioned, viz.: Hays, Fairchild and Settle, constitute the second crop of small-pox that occurred here.

The next group of cases broke out between April 26 and May 1.

Henry Martin, resided on Perry street; was taken sick April 26.

Richard Rider, resided on Williams street; taken sick April 26.

Howard Hays, taken sick May 1.

Chester Hays, taken sick April 26.

Mrs. O. Hays, taken sick April 28.

The two children had small-pox and died. Mrs. H. had varioloid. These were the family of Oliver Hays before mentioned.

Mr. A. Hathorn resided on Main street, and was taken sick April 28.

Hiram Yanney, residing on Perry street; taken sick April 28.

Daniel Kennedy, resided on Perry street; came down with small-pox April 28,

Mr. McLain resided on Prospect street; taken sick April 28. There were nine members in his family; four other cases of small-pox occurred.

Mr. P. Holman, resided on Gleebe street; taken sick April 29; six in family, one had small-pox.

Howard Shull, resided on Perry street; taken with small-pox April 30.
Daniel Wormuth, resided on Cayadutta street; sick May 1.

Mr. O. Peck, resided, on East State street; taken May 1; six in family. Two more cases reported here. This comprises the third crop of small-pox that occurred in our community. Eight of these cases were confluent. Three proved fatal. The other six cases were varioloid. Eleven of the number were infective by personal contact with Settle. Most of the cases included in third crop were removed to pest house as soon as reported to pest house (as the community were sufficiently aroused at this juncture of affairs to procure such an institution and a health officer had been appointed and was acting in concert with the Board of Health, which was now regularly organized,) crowded families where small-pox had broken out were quarantined and strictly watched, houses thoroughly fumigated and disinfected where contagion had been.

About May 13th seven other cases occurred in the following families: Two in O. Peck's, father and sister to O. Peck already reported; these were varioloid. The father was over eighty years of age, colored. Four cases broke out in the family of Mr. McLain on Prospect street, also reported; three varioloid. One confluent small-pox. The last case was in the family of P. Holman, Gleebe street. This is the fourth and last crop. The whole number of cases of variola was thirteen; none had ever been vaccinated. There were eleven cases of varioloid, all of which had been vaccinated in early life. About May first at the suggestion of the State Board of Health a house-to-house visitation was provided and vaccination enforced as far as could be.

Respectfully,

R. H. CAMERON.

SMALL-POX IN GLENS FALLS AND QUEENSBURY.

The following report has been made by the health officer of Glens Falls and Queensbury.

To the State Board of Health :

The following is a brief report of an outbreak of small-pox in our village last summer : The disease first appeared late in June in the family of Adolphus Guyette, on the corner of Elm and Orville streets, near the western limits, and simultaneously on Montcalm street ; still further west, outside corporation limits, in the family of C. Barney, and at the house of George Guyette, on the Hackett road. The contagion was brought here by a son of said Adolphus Guyette, who had just left his place of employment at a hotel in New York to visit relatives here. He spent one night or more at each of the above-named places. He had a crusty eruption on parts of his face at that time. In about two weeks after his arrival here small-pox made its appearance in the families which he had visited. The houses in which the contagion thus appeared were immediately quarantined, and vaccination commenced in the infected district and immediate vicinity. Steps were then taken by the village Board of Health to secure a site for a hospital, which resulted in the erection of one on the bank of the river, a short distance below the State dam, on lands owned by Messrs. Finch, Pruyn & Co., who kindly gave permission. Meantime other cases appeared on

Montcalm street, and when the Board of Health was about to remove them to the hospital, the proprietors, on whose land the hospital had been erected, refused to have it occupied, thus making it necessary to find another location. About this time the town Board of Health perfected its organization, took the matter in hand, and erected a hospital about one mile and a half west of the village. Fearing that the disease might appear in two extensive manufactories of shirts and collars, the health officer required that all the operatives should be vaccinated.

The proprietors, Messrs. Libby & Spier, and Messrs. Fowler & Co., promptly responded. They posted the rule for vaccination, and enforced compliance with it, and none of their employees were allowed to work without a certificate of approved vaccination from a physician.

In addition to this precautionary measure, these manufacturers placed their entire stock of freshly-made goods, which were being daily received from the dwellings throughout that district of country, in which much material is distributed for making up, under the health officer's control. The goods were subject to protracted sulphurous fumigation in closed apartments at the factories.

By this means not a case occurred in either of these buildings, wherein about six hundred persons were employed, and consequently there was no interruption to their business.

Much credit is due to the proprietors of these factories for their prompt and energetic action in this matter. The town Board of Health offered free vaccination to all, and the town and village were divided into inspection-districts, and a physician appointed in each district to vaccinate all who would avail themselves of this protection. Unfortunately the physicians who attended to this gratuitous offering of vaccination neglected to keep complete records of the work, consequently I am unable to give the *percentage* of those that received benefit from vaccination or re-vaccination. About three thousand two hundred (3,200) were vaccinated in all, however. Bovine virus was obtained from Chelsea, Mass., the Dispensaries, New York, and the Health Department of New York city, the last mentioned having our decided preference.

Up to the time of the completion of the hospital, about the 16th of August, fifty cases of variola and varioloid had appeared in the infected district, which had been kept under rigid quarantine. The first case that was taken to the hospital was on the 16th of August. The whole number admitted, thirty-two; number of deaths, five. Number treated in private hospital huts, erected near the first or public one, three. Whole number of cases treated at home, fifty-eight, eleven of which died. Whole number of cases of small-pox, including varioloid, since its outbreak in June last up to November first, at which time the disease was suppressed, and the hospital closed, ninety-two. Total number of deaths, eighteen, or about nineteen and one-half per cent. In view of the large number of cases which occurred before we established our hospitals, and the rapidity with which the contagion spread, it seemed impossible to suppress it, or prevent its spreading through the entire village and town; but by untiring efforts, both night and day, a prompt removal of all new cases to the hospitals, and a thorough system of vaccination, we have conquered, yet not without opposition, as ill-timed as it was useless. It is to be regretted that our entire community

did not at first act as a unit in vanquishing this formidable enemy; yet, with two or three exceptions, the physicians acted with the Board of Health, and were ready to second its efforts in suppressing the disease. Through the influence of these dissatisfied doctors, a spirit of opposition showed itself in the community at large, which tended to retard and embarrass the labors of the Board of Health and health officer in particular. Too much praise cannot be awarded to Dr. W. W. MacGregor, who so nobly and fearlessly assisted the health officer in this trying ordeal; ever ready and willing to do battle against this fearful enemy, he rendered prompt and efficient aid in stamping it out. Appended is his report as physician to the hospital ——— Dr. E. L. R. Chapin rendered valuable assistance in treating the sick in their dwellings, and heartily co-operated with the Board of Health, as did also Dr. Eddy.

And to the State Board of Health we are indebted for prompt and valuable advice in our time of affliction. It was by your kind encouragement that we were enabled to do battle more zealously and fearlessly against the dreaded enemy, for which kind aid and assistance accept our thanks, and through us the thanks of our two Boards of Health.

M. R. PECK, M. D., *Health Officer.*

GLENS FALLS, *December, 1881.*

The Hospital Report.

Dr. MacGregor concludes his report for the season as follows :

"The hospital doors are closed, and I trust it may never be necessary to re-open them. As physician in charge, I respectfully submit the following report:

Number of cases treated in hospital.....	32
Number died in hospital.....	5
Average number of days each patient in hospital.....	15.33
Number of patients under 5 years of age....	5
do do 10 do	8
do do 20 do	10
do do 30 do	5
do do 50 do	3
One patient..... 67 do	1

Total 32

Number in all, patients and friends who came with them 47

Per cent of death in hospital, 15.62.

"There were two private hospitals erected near the main one, in which there were three patients, two of whom died from hemorrhagic small-pox.

(Signed), W. W. MACGREGOR.

"GLENS FALLS, N. Y., *Nov. 9, 1881.*"

SMALL-POX ON EMIGRANT TRAINS, AND AS SPREAD BY THE EMIGRANTS.

Warnings and action of the Health Officer of the Port of New York to Prevent the Spread of Small-pox by Immigrants. — Throughout the last six months of 1880, and until the present time, the health officer of the port of New York has lost no opportunity to advise and warn the health

authorities throughout the United States whither immigrants go from Castle Garden, that the utmost vigilance and care will be necessary to prevent the outbreak of small-pox from contagion unsuspectingly conveyed by immigrants and their baggage.

Dr. Smith, health officer, has given very good reason for this warning, after all the sanitary precautions which the laws authorize him to adopt at his station, the gateway of immigration; namely, that a large proportion of the European immigrants are landed at Castle Garden from one to four days before the usual period of incubation (14 days) of small-pox contagion has expired and consequently that such migrants may reach any point by railroad transportation between New York and the Mississippi before the recognition of the development of small-pox contagion that may have been contracted at the port of departure, or from infected baggage.

Buffalo Health Officer's Action.— During the months of April and May small-pox appeared upon emigrant trains, and among the emigrants arriving at Buffalo. May 23d, the health officer of that city communicated to the common council the following statement with reference to the dangers impending in Buffalo, which had then a fatal illustration in the tenements occupied by Polanders in Alabama street :

BUFFALO, May 23, 1881.

"I desire to call your attention to the over crowded condition of several tenement houses in the city, especially in the Third ward, chiefly situated on Carroll and Alabama streets, and occupied generally by Polanders, who are very filthy in their habits. The Board of Health under title XII, section ten of the charter, have the power to remove families from overcrowded buildings. The danger from small-pox, caused by the arrival of emigrants from infected steamships and other vessels, moving into these already overcrowded tenements; renders it necessary that they should exercise this power at once as a matter of public safety. The question that confronts the city authorities is, "what shall be done with these people?"

"I know of no better, or more economical way of caring for them, than for the city to build sheds, or barracks of cheap lumber on some of the large vacant lots in the eastern part of the city, at some point where hydrant water can be obtained in abundance, and establish a sort of a quarantine for these disease-suspected emigrants, where they can be housed on their arrival, at least during the summer. They can thus be made comfortable, and the public health preserved from the infectious disease they are liable to impart.

"I suggest that all families of emigrants arriving hereafter suspected of disease be required to take up their residence at such place when established, until all danger from small-pox has passed away. Within the past three weeks we have had several cases of this loathsome disease; and in every instance it has been among emigrants."

Your attention is called to this matter as one of grave importance, and prompt action should be taken.

Respectfully submitted,

A. H. BRIGGS,

Health Physician.

The common council immediately took the following action: That the Board of Health, together with the committee on sanitary matters, be authorized to take measures to overcome the difficulty, at an expense

not to exceed \$500, and that the health physician be directed to communicate with the commissioners of emigration in New York to ascertain the best mode of relief.

Adopted.

This beginning of a defensive work in Buffalo was urged by the State Board of Health to be extended sufficiently to give full protection to the emigrant trains before passing beyond the limits of the State of New York. Temporary barracks were constructed in Rich street, East Buffalo, and the infected houses on Alabama street were speedily cleared. Numerous uninfected families of that district were temporarily housed in dwellings on Best street. The prompt action of the Common Council enabled the Board of Health to appoint suitable medical assistance, "and they called upon the Superintendents of the Erie and Central railroads, and they not only heartily indorsed the plan, but promptly furnished regular transportation to and from Attica and Batavia. During the week the two physicians have boarded every emigrant train at the stations named, and examined every immigrant for contagious disease. In case of small-pox, the car in which the patient is found is cut off at East Buffalo, thoroughly disinfected, and the necessary precautions taken to prevent the disease spreading. The wholesome benefit resulting from this system can be readily appreciated."

This practice continued so long as there was daily great danger from the arrival of emigrants in the first periods of small-pox. It was then, and is still, urged by the Buffalo Board of Health that such action can be taken, that at, and between the emigrant ships and Buffalo there shall be an efficient sanitary inspection of every emigrant train, all along the great highway of travel—from New York city to the West. These emigrants are the cause of most cases of small-pox, it having already made its appearance at Hornellsville, Buffalo, and Suspension Bridge."

"Our method is to meet the incoming trains at some convenient point outside the city, far enough away to give us ample time before the train arrives here, to inspect every passenger the train contains. This work we propose to continue during the summer, and as much longer as the flood of immigration keeps up. I am satisfied that all that is needed to keep small-pox and other infectious diseases from being spread throughout the country by these immigrants is the hearty co-operation of other local Boards of Health," aided by the State Board and National Board, in carrying out the system."

Action at the Chicago Conference.—Early in June a movement in harmony with this in New York was organized in the western States, and a conference called to meet at Chicago, June 29, at which a delegate attended, for the New York State Board of Health and to which this Board communicated the following suggestions, which were in substance adopted :

"That inasmuch as the migration from Europe to the United States for many months to come will continue to exceed any former experience, sanitary regulations will need to be adopted at all ports of departure whence the contagion of small-pox is liable to be brought to this country by persons and baggage ; further, it may not be practicable to enforce such quarantine detention at the ports of arrival in the United States as to remove and prevent all possible means of conveying the contagion far inland. Therefore, in view of these facts, the

health officer of the Port of New York, and the sanitary authorities represented in the Chicago conference had before them the question, "How shall the contagion, that is developed while the emigrant is *en route* westward from New York and elsewhere, be most speedily discovered and controlled?"

These propositions for such sanitary service relate to those letters, and with the action recommended by the New York State Board, as well as by the National Board of Health. The propositions for such a sanitary service relate to

- (1) Reinspection Stations,
- (2) Local Quarantines,
- (3) Positive Preventive Sanitary Regulations in Europe.

It seems obvious that international *sanitary obligations*, and certain official methods and forms must be agreed upon. These should be at once provided by *international agreements*, such as—

1. A system of thorough inspection and vaccination at every port of departure in Europe and the North American States, of all unprotected emigrants. This may be secured by the National Board of Health, and the President of the United States at all ports in our own States, and by the comity of international agreements with the governments of Europe at all their ports.

2. By adding to the utmost efficiency of the quarantine systems of each American port such form of records and symbol-cards* that the persons who, among the emigrants, are believed, and by inspection are certified, to be protected, shall pass without hindrance on their way through our country; and by a suitable variation of symbol-cards*, also to provide the indication or sign, by which all persons who need shall be reinspected as they move onward.

3. To bring into full accord the State and National Board of Health methods of co-operation for the prompt destruction of small-pox wherever it may appear at central stations along the routes of migrant travel by railroad and steamboats.

4. To secure in every State the most effectual means of local and the necessary State control over the discovered sources of contagion, the quarantining of the sick, and the vaccination of persons.

In conclusion, the undersigned would state it as the conviction of the sanitary authorities whom they know, generally, at the east, that in the present course of immigration, there is greater security in the speedy dispersion of the vast companies of migrants, as soon as all evidence of the presence of the small-pox contagion is closed and in a practical way provided for, than could be obtained by a longer detention of these companies. Though it may be only a *choice* between possible perils, the least of the two perils is to be accepted, and the greatest possible degree of justice and all available means for self-care and safe-guarding shall be insured to the greatest number.

Reinspection and a system of *international* as well as *State agreements* and means for obtaining the protection of our entire country against small-pox, may, as we believe, be so devised as to insure the approbation and cordial support of all concerned in the repression and extinction of small-pox.

The details of the plan for insuring protection to every emigrant

* This has been adopted and is termed the vaccination protection card.

before departure from any port in Europe, and for re-inforcing the safeguards as the migrants disembark at any port and pass into, or across, the States, can be arranged.

This statement was drawn up and signed by a committee of this Board, authorized to present its views to the Chicago conference, and it is fully in accord with the action taken at that inter-State meeting.

SMALL-POX AT LOCKPORT.

Early in October a Mrs. P. died of small-pox that was certified by the medical attendant as erysipelas and acute eczema. Other cases of small-pox followed in the same family and in families living in the same house. These cases were not reported as small-pox until several were already suffering from varioloid. Immediately upon the discovery of the malady, the city Board of Health assumed control and directed the Health Officer to appoint eight physicians to assist him in house-to-house vaccination, which duty was rapidly performed until the city thus gained protection against the contagion.

As soon as the nature and extent of the danger had become known in Lockport, the facts were judiciously communicated to the sanitary authorities of the city of Rochester, which is only two hours distant by rail, who provided effectual means for the best vaccinal service by physicians through that city.

Various vaccinal farms supplied Rochester at the rate of 1,000 slips every second day until 40,000 people there had been vaccinated.

Inquiry into causes that led to neglect to report the first cases of small-pox in Lockport, has taken a judicious form and will result in the public benefit.

The Health Officer of Lockport, Dr. W. J. Ransom, reports that from October 20th to January 1st, fifty-three cases of small-pox occurred, and that during this interval of ten weeks the city and vicinity were put in a condition of thorough protection.

NOTE.

The conditions under which complete protection against small-pox has been enjoyed by numerous communities, some of them situated in the midst of and between cities and villages in which small-pox was ravaging the population, present conclusive evidence of the protection which vaccination affords. The complete protection secured by several crowded and extensive manufacturing establishments has been so confirmed as to leave no doubt that this security was attained solely by vaccination of the unvaccinated, and re-vaccination of the other employes.

Small-pox has been harming the State only where the neglect of vaccination invites the fatal contagion. It has spread in no school or factory, or other assemblage, where there had been even reasonable attention to vaccination, and it has been arrested readily and completely only where vaccination and re-vaccination were promptly and universally offered. Its continued prevalence in any place of business and trade in such city, has been due to the neglect of the local Boards of Health whatever other causes have been in operation. In one city of less than 60,000 inhabitants the continued prevalence of the contagion is said to have harmed its trade interests to the extent of more than a

million dollars in ten months; and had not the health authorities of Buffalo promptly controlled the contagion in that city, its trade losses would have been in excess by one hundred fold the cost of the health government there during the past year. In no place in New York has small-pox found such an unguarded population as it frequently has in States further west, and even in the neighboring State of Pennsylvania. The following letter from the Mayor of Allentown, Pa., conveys an instructive lesson to all communities in which vaccination and prompt sanitary procedure are neglected:

MAYOR'S OFFICE,
ALLENTOWN, PA., Dec. 19, 1881. }

Secretary State Board of Health, New York:

Dear Sir — Please accept thanks for your promptness and kindness in sending information, advice and instructions to us. About six weeks ago a child was taken with small-pox and died without a physician having been called in. It was pronounced a case of measles by the family. A public funeral was held. Before this time our city had been remarkably free from the disease. When a case presented itself, measures were at once taken to prevent the spread. The father of the above named child made clothing for a merchant tailor, one of the members of the family worked in a large cigar factory, and there had been a very free interchange of visits by the neighbors. A few days after the funeral the whole family (eight persons) were down with small-pox, and in less than five days we had thirty-four cases in different parts of the city. You can readily imagine the panic and consternation that followed. We immediately took measures to prevent the spread; urged general vaccination; quarantined the families as far as was possible with the small force at our command. Unfortunately the city councils did not give the Board of Health the encouragement it required at the outset, and the Board being restrained to some extent was not able to take the strenuous measures it subsequently did, after the council removed all barriers.

We have had one hundred and three cases, and twenty-three deaths. A large number of the fatal cases had exhaustive hemorrhages from the nose and throat; were confluent, dying of congestion of the lungs, congestion of the brain, or from exhaustion. We found that all cases that were confluent had never been vaccinated, or never since childhood.

* * * * *

DIPHTHERIA DURING 1881.

This disease continued to be reported from different parts of the State every month in the year. Its devastations have been greatest in the districts which, until within the past few weeks, had no sanitary organization, yet in the cities of New York and Brooklyn the total mortality from diphtheria has been large, 1152 deaths having been recorded in Brooklyn, and 2249 deaths in New York in the year. The published reports of city Boards of Health show how tenaciously the cause of diphtheria clings to crowded districts.

Diphtheria in Salamanca.—The secretary of the Board of Health in this village on the 5th and 13th of May communicated the following facts: "We have had a number of cases of diphtheria in two weeks,

nearly all fatal. The first case was thought to be membranous croup, and no attempt was, therefore, made to keep the other children from that patient. Two in this family died, also a cousin, allowed to be with them. A girl working in the family was next taken. She went home and recovered, but she had communicated it to four others in the family, three of whom died, and one is now sick. Another family, where we cannot positively trace the infection, had two light cases, young ladies; both recovered. We now have one more case, some distance from others, where we cannot trace infection."

The Board of Health organized and worked effectively, published and posted the recommendations of the State Board, cleaned up their village, and instructed the ignorant concerning their sanitary duties.

Diphtheria in Warren and Essex Counties.—Through a district of some fifty miles in length, northward from Warrensburgh and Johnsburch, and extending westward over a width of at least twenty-five miles from Schroon lake and its outlet, diphtheria prevailed in its most malignant form until late in the autumn. The inhabitants of Chester-town and Schroon organized their town Boards of Health late in the summer, and secured effective methods to check the spread of this contagion. In the towns of Minerva and Johnsburch the disease continued its devastations until late in the autumn. The following extract from an appeal of a school district clerk in the mountain region of Johnsburch, correctly sets forth the situation of one of the remote regions of its prevalence:

"Our town has been terribly imposed upon by careless persons in regard to diphtheria. There are several cases close by me. They take the clothes of the dead and hang them out near the highways, and throw their slops about. Even those who attend the sick run out and in at all places, spreading this diphtheria in all directions. I am afraid that my family will perish with the rest of them, if there is not something done to protect the people in all parts of this town. There must be something done to stop the spreading. There have been three deaths this last week, and a number more are expected to die. I think the State Board is in duty bound to take notice of this contagious disease that is killing off our people. Our town has lost within two years perhaps four hundred with this disease, and no one to say a word to stop it spreading. It is not only for my own family, but for all my fellow townsmen that I write. Some action must be taken."

Remote from physicians, and hitherto unreported to the State Board of Health, the families and neighborhoods that were suffering were not to be neglected for a day, however exaggerated such a statement might prove to be. Dr. James S. Cooley, health officer of Luzerne, was immediately commissioned by telegraph to go through the affected regions of Johnsburch, and to extend his investigations as far as he found there was any extension of diphtheria, to give the people all needed information and counsel, and to confer with medical men wherever he found they had been in attendance upon diphtheria. This efficient sanitary helper complied with the request, and has made the following brief report upon his observations in that field:

Dr. Cooley's Statements.

While upon the first tour of investigation Dr. Cooley writes: "I have spent two days in the north-western part of the county. I found a bad

state of things in Johnsburgh, owing to an almost total disregard of any precaution as to spread of disease. An undertaker, living at Weavertown, laid out a child two miles away, and carried home the infection to two of his children. I have enlisted help there in getting at the facts. I think the report from the clerk of school district No. 3, of 400 deaths from diphtheria is not much exaggerated. At Indian Lake, there has been a sad state of things; twenty-two deaths are reported within the last few months, from diphtheria and typhoid fever.

I have the honor to report as follows upon the outbreak of diphtheria in the towns of Chester, Warren county, Minerva, Essex county, in accordance with instructions from you:

DIPHTHERIA IN WEST CHESTERTOWN.

Chestertown is one of the northern tier of towns in Warren county, lying between the Hudson and Schroon rivers. The portion here referred to is the north-east corner of the township, situated next to the town of Minerva, Essex county. The land lies high, is generally well drained, and the soil a gravelly loam.

The first group of cases of diphtheria, of which we can find an account among the people and their physicians, occurred in December, 1877. Daniel Shaw's wife and two children, aged 5 and 3 years, respectively, were attacked with the disease. The children both died, one on Dec. 13th and the other on Dec. 16th. The mother recovered. The source of contagion for this family was probably some case in the adjoining town of Johnsburgh, where Mr. Shaw did his trading.

A neighboring family by the name of Higgins was next to suffer. A daughter in the family visited at Mr. Shaw's during the illness of his children, and a grandchild in the H. family was brought home from North Creek, when recovering from diphtheria. From one of these sources the Higgins girl was infected, and she and three other grandchildren living in the house had the disease and all recovered.

The second group of cases occurred some months later, in July, 1878, in the family of F. Smith, living about one mile from Mr. Higgin's, mentioned above. Mr. Smith saw a case of diphtheria at North Creek, and a few days after, his daughter, aged 13, was attacked with the disease, and shortly after his youngest child, a boy of 4 years; the girl died during the night of July 1st, and the boy the next morning. His other boys, three in number, had the disease, but all recovered.

The third group was in August and September, 1880. Henry Russell's sister saw or took care of a case of diphtheria out of town, and came to her brother's to care for his invalid wife. R.'s boy, aged 13, and a hired girl took the disease, and the boy died.

William Goodspeed, Russell's brother-in-law, came to Russell's while they were sick, and attended the boy's funeral. As a consequence, Goodspeed's two boys were taken August 20th, and 24th, respectively, and died August 23d and September 5th. The infection was undoubtedly brought by Russell's sister.

There were mild cases in other parts of the town, but no deaths, except in W. Russell's family, one child died out of four who had the disease.

All of these cases appear to have resulted from carelessness or ignorance of the danger of exposure; and these eight deaths and upwards of

twenty cases of this dread disease, preventable by enlightened sanitary precautions.

West Chestertown.

1877.

Family of	Number in family.	Number of cases of D.	Number of deaths.
D. Shaw.....	4	3	2
Mr. Higgins.....	3	5	
1878.			
F. Smith.....	7	2	2
1880.			
H. Russell.....	3	2	1
Wm. Goodspeed.....	4	2	2
W. Russell.....	6	4	1
Totals.....	27	20	8

Diphtheria in Minerva, Essex County.

Minerva is the south-western town of Essex county, and the following group of cases of diphtheria occurred in the south-east part of the town, in the hamlet, known as Olmsteadville, near the Warren county line, situated on Minerva creek, and at a considerable elevation. The diagram shows only the location of the dwellings where the disease occurred.

Early in April, 1881, Dr. J. C. Wall, to whose care and labor I am indebted for the facts in reference to these outbreaks in West Chester and Minerva, was called, professionally, to see a little girl of Thomas Barss sick with diphtheria. The Barss girl recovered, her case probably being a mild one. But alas,

Dr. Wall had four children whose ages were from two months to four and a half years. To these he brought the infection, and as a result, one child was seized with the disease April 11th, and two others on the 12th, and all died. Mrs. Wall also had the disease, but recovered.

The adult members of the families of J. Lyndsay, Charles McGinnis and P. Sullivan, who were relatives of Dr. Wall's family, were frequently at the doctor's house during the sickness of the children, and were present at the funerals which were held at the house and fully attended.

April 28th, the disease appeared at J. Lyndsay's, where there were five children, all of whom had the disease, and two of whom died.

The following day, April 29th, the McGinnis family was attacked; here were also five children, two of whom died.

One week later, May 6, four children and a servant girl in the family of P. Sullivan were attacked with diphtheria at the same time. Of these, all recovered but one child.

Wesley Barnes had attended many of the funerals, and his family were the next to suffer. On May 12th his children were taken sick, but all recovered.

While Barnes' children were sick, *other children visited* the house, among them a daughter of Mrs. Sherman, living west, across the creek, who was attacked with diphtheria June 24th and died.

Mr. Morrisy's boy also took it home and three of Morrisy's children had the disease and two died. Morrisy lives up the creek from Mrs. Sherman's.

O. P. Morse lives opposite Mrs. Sherman. His niece, living with him, was attacked June 15th, but recovered.

S. P. Cobb's boy visited at Barnes' during the sickness there. He was attacked with diphtheria June 22d.

Other cases occurred during this period, the exact data of which I have not been able to obtain. But the terrible nature of this scourge is evident from the fact that there were twenty-seven deaths out of fifty-six cases.

From this narrative some conclusions may be deduced which are worthy of special notice :

1. Mild cases of diphtheria may be the source of contagion that soon result in succeeding cases of great severity.

2. Carelessness in visiting the sick and in attending funerals may spread the germs of this fearful disease far and wide. The funerals were all held at the houses where the deaths occurred and were generally fully attended.

Olmsteadville.

Family of	Number in family.	Number of cases of D.	Number of deaths.
J. C. Wall, M. D.....	6	4	3
J. Lyndsay.....	7	5	2
C. McGinnis.....	7	5	2
P. Sullivan.....	11	5	1
W. Barnes.....	6	4	
O. P. Morse.....	3	1	
Mrs. Sherman.....	2	1	1
M. Morrisy.....	6	3	2
Totals.....	48	28	11

There were cases in the families of L. Hammond, C. Bissell, Mrs. D. West, and S. P. Cobb, but the facts are not at hand to tabulate. All of the above cases occurred between April 2d and June 27th, 1881.

All of which is respectfully submitted,

(Signed)

JAMES S. COOLEY, M. D.

LUZERNE, N. Y., *January 3, 1881.*

Note on the Introduction of Diphtheria in the Village of Lake George, Warren County.

While investigating the course of diphtheria in the mountain districts of Essex and Warren counties, the following account of the introduction and limited spread of this disease in Lake George village was communicated by health officer Adamson:

In January, 1878, Mrs. M. went to Albany, taking with her George, a little boy three years old. The little fellow was quite well at supper-time, but taken sick shortly afterward, and died at four the next morning. The attending doctor gave a certificate of death from membranous croup, and the body was brought home for burial, and the

coffin opened at the house (marked on accompanying sketch I). Within a few days a brother of George, named Charlie, aged five, was taken ill and died from diphtheria. Willie West, aged six, a cousin of the aforementioned (at the house marked II) was the next, he died; then his mother, Julia West, was taken ill and died; then Howard W., aged three, died. (At the house marked III) Morris Stanton lost two children, both from diphtheria, about the same time. 'An aunt and uncle of the two first mentioned children had diphtheria, but both recovered (at the house marked IV). These cases all occurred between January 12th and February 14th, 1881. Duane West, having lost his wife and children, left the house marked II, and shortly afterward it was occupied by another family. I do not know their names, but a relative of theirs, who paid them a visit, was shortly afterward very ill from diphtheria and, I think, died.

SPECIAL INVESTIGATIONS OF DISEASE IN RICHMOND COUNTY.

As one of the earliest results of the observations and records instituted by the Board of Health of New Brighton was a demonstration of the fact that the death-rates in different districts of the exceptionally salubrious and beautiful town of Castleton, within that Board's jurisdiction, vary so greatly as to be accountable only upon the supposition that local causes and domestic conditions will adequately explain the excessive mortality in particular streets and upon numerous well defined areas in the township. The State Board invited Dr. Alfred L. Carroll, the recent president of the local Board of Health, in Castleton, to undertake certain investigations concerning the endemic fevers and other diseases in the counties of Richmond, Kings and Westchester. His preliminary report is here appended, and it relates to only the first questions submitted to him for his examination and reply:

Notes on Some of the Sources of Endemic Diseases in Richmond County.

BY ALFRED L. CARROLL, M. D.

Richmond county, the surface of which, throughout nearly its whole extent, consists of a bed of glacial drift and disintegrated magnesian rock of varying thickness, has long held prominent rank among the malarial regions of the State, and during the past year its endemic fevers have shown a marked increase in prevalence and in severity. Intermittents and remittents have in an unusual number of instances assumed the pernicious form, and "typho-malarial" fevers have prevailed in several localities. As regards these latter, two classes of cases appear to be distinguishable: one in which true enteric fever and malaria co-exist in the same person, and another wherein common filth-poisoning superadds its depressing influence to a malarial attack.

The accompanying sketch will show the localities of the less usual endemic fevers as far as my present information extends. Of the lower part of Westfield, I have no recent knowledge, but in past times the district about Tottenville and Pleasant Plains has produced severe forms of malarial fevers and numerous cases of typhoid. No tract of any extent in the country is free from malarial diseases, even the higher elevations of Castleton and Middletown furnishing numerous examples. Along the shores lie about eight thousand acres of salt marsh; scattered

through the interior are ponds and swampy lands, aggregating many hundred acres, whilst the quasi stratification of the drift by the waters of the receding glacier has left over the greater part of Staten Island beds of impervious clay. In 1874 a committee of the Richmond County Medical Society reported that "not less than one-half, and in many portions four-fifths of the prevailing diseases are either directly caused or seriously aggravated by the malign influences resulting from insufficient drainage," and subsequent experience affords no ground for modifying this statement.

There are two misleading features about all maps purporting to indicate the topography of endemic disease: First, because greater density of population gives to certain localities an apparent pre-eminence of unhealthfulness; and, second, because domestic insanitary conditions are often the principal, if not the only, factors in the production of miasmatic disorders. Especially is this true of the malarial class of fevers. The chart of Castleton, for instance, being based upon the number of cases of malarial fever reported, necessarily attracts attention chiefly to the thickly settled wards on the shore of New Brighton, whilst some outlying districts wherein the telluric conditions are as bad, or worse, enjoy on paper a seeming immunity, simply because they are very sparsely, or not all, inhabited. On the other hand, in places where the natural environment is least unfavorable, faulty household arrangements may induce, so to speak, an artificial paludal miasm. Decaying vegetable matter in a damp cellar, or soakage of the adjacent soil with "kitchen slops," may effectively imitate in miniature the morbid conditions of natural marsh lands, especially where, as is often the case, furnaces are contrived to carry cellar-air into the upper rooms of houses, creating in addition an indraught of the ground atmosphere laden with the products of decomposition. The not infrequent occurrence of intermittent fever during the depth of winter has in all instances within my observation seemed attributable to sources of the latter kind.

Reference to the map of Castleton (in which alone any registration of disease has been attempted) shows certain groupings of cases, some of which deserve particular mention. In the fourth ward, the lateral soakage of the "Factory Pond," and of the backed-up stream feeding it, has induced saturation of the retention soil for a wide surrounding region; but, beside this, faulty grading of streets and obstruction of natural drainage channels, either by the public authorities, or by private property owners, have held back the surface water in many places. In the absence of sewerage, nearly every house in this thickly populated district has its leaching cess-pool, except where the brook serves as a convenient conduit for house refuse, and a plentiful supply of organic matter is thus instilled into the damp earth. The neighborhood on the south and south-east of this pond, and the adjoining portion of the third ward, show a high "consumption rate," and have also furnished during the past year the greatest number of cases of diphtheria, scarlatina, and diarrhoeal disorders.

The settlement at the northern portion of Broadway and Burgher avenue consists, for the most part, of ill-constructed houses, built upon the site of a former alluvial basin, which originally formed the outlet for the surface-drainage of a considerable extent of upland. The filling in of this basin, as I am informed, comprised a large amount of organic rubbish, and the careless habits of many of the residents



Location of Malarial Fevers, 1881.
24 Annual Report, State Board of Health.

T. A. E. BUSTEED, Village Engineer.

augment the pollution of the undrained made-ground. The streets in this neighborhood have been raised, in some instances, several feet, with the result of flooding most of the cellars in rainy seasons. Numerous as are the malarial markings here, and in the previously-described vicinity, it is to be remembered that probably two-thirds of the sufferers from intermittent fever in such a population rely upon patent medicines, or counter-prescribing druggists, instead of consulting a physician, and thus elude medical observation.

In Davis avenue I am assured that malaria is of comparatively recent introduction; its gradual increase has fallen under my own notice. Some years ago the village authorities raised the shore end of the avenue, and filled in the lower part of its declivity to such a height as to destroy its carrying capacity for surface water. This, with the obstruction of a natural drainage-channel, which formerly ran through private property, on the western side of the avenue, has dangerously aggravated the evils of soil-humidity.

A localized endemicity of malarial and septic diseases, in marked contrast with the comparative healthfulness of the surrounding neighborhood, is noticeable in a cluster of cottages between second and third streets, in the Second ward. The ground here is soaked with sewage from cow-yards and stables, privies, and cess-pits; house-refuse and garbage are accumulated on the premises, or cast into the gutters, whilst the street-gradings impede, rather than promote, surface drainage. Diphtheritic and septic fevers have been of frequent occurrence.

These examples are specified as illustrating the proposition that, throughout the built-up portions of New Brighton, malarial conditions are largely of artificial creation. From Tompkinsville to West New Brighton the drift is underlaid by a massive bed of serpentine, with a general north-westerly slope from an altitude of 280 feet to the shore of the Kill-von-Kull, the valleys of undulation in the high-lands affording no impediment to soil-drainage if their courses were respected. There are few, if any, streets wherein the surface water could not be easily deported by proper surface-grading. An ample water supply has recently been introduced by a private company, and it is to be feared that the greatly-increased use of water thus facilitated will, in many places, aggravate the evils of soil saturation until cess-pools are replaced by sewerage.

The picturesque "Clove valley," which forms an outlet from Silver lake (the only natural sheet of water in this region), and from much of the surrounding upland, has been injured by the construction of a chain of artificial ice-ponds, the level of which is alternately raised and lowered. The miasmatic influences thus created have rendered some localities absolutely untenable.

From the margin of the serpentine westward the town of Northfield is underlaid by triassic sandstone, intersected by a trap-dyke, extending from Port Richmond to the mouth of the Fresh Kills. The general level of this sandstone, interspersed with basin-like depressions, offers a drainage problem of some difficulty throughout the region from Graniteville to Springville.

The districts on the south and east of the belt of gneiss, comprising nearly the whole of the towns of Westfield and Southfield, lie upon cretaceous beds of clays and sands, covered in most parts by drift or alluvial deposit. The marshes along the shores of the Kills and Lower

Bay, composed of silt, clay, and decomposed vegetable matter, are continually receiving fresh accretions from the growth and decay of marine plants.

This brief sketch of the geology of Richmond county, for which I am indebted to an excellent paper by Mr. W. L. Britton [*Ann. N. Y. Acad. Sci.* Vol. II, No. 6.], may serve to explain to a certain extent the widespread existence of the ordinary paludal fevers. Notwithstanding the painstaking researches of many observers and the latest advances of the "germ theory," the primal ætiology of most diseases of the zymotic class is still beyond our ken, and we can do little more than to note the circumstances associated with their development. Most prominent among such circumstances in the case of malarial fevers are the presence of decaying vegetable matter and dampness of soil. Either actual marshes or lands having a substratum of impervious clay or rock with a sandy superficies, are known, the world over, as the most prolific sources of malaria, and both of these abound, not only on Staten Island, but along the borders of the East river and lower part of Long Island Sound, and far up the valley of the Bronx river. In such areas the manifestations are more marked when, as during the past season, a prolonged drought lowers the ground water and exposes for fermentation, layers of organic matter previously submerged. But the presence of malaria in districts where these conditions are apparently lacking, and its reported absence from places where they exist, point to some additional facts, or rather, perhaps, to an ultimate specific cause. Whether the "*bacillus malarie*" figured by Klebs and Tommasi-Crudeli will hold a more prominent place in medical literature than Salisbury's "*palmella gemiasma*," remains to be seen, thus far, the admirable report of Dr. Sternberg to the National Board of Health on this subject, and my own incomplete observations, seem to warrant a provisional Scotch verdict of "not proven." It is, at all events, a matter of common experience that thorough soil-drainage has been effective in abolishing the conditions under which malaria formerly committed its worst ravages in many parts of the country.

The question as to the possible conveyance of the malarial poison by drinking-water is one which cannot be satisfactorily studied where other miasmatic influences are so generally prevalent; nor, for the same reason, can any clear evidence be here adduced respecting the distance of aerial transportation. An apparent increase of paroxysmal fevers has in some places followed the clearing of neighboring woodlands; but whether this has been due chiefly to the removal of foliage-screens, or to the intensification of local agencies by public and private miscalled "improvements" is difficult to determine.

Of the graver endemic maladies associated with malaria, the short time at my disposal has enabled me to make but few local investigations. The past summer and autumn have furnished an unusual number of dysenteric and "typho-malarial" cases; but a study of the origin of these is hampered at the outset by uncertainties of diagnosis and pathology. It is well known that in the severe forms of malarial fever infiltration and suppuration of the follicles of the colon, with other evidences of an intense catarrhal process, have been frequently demonstrated. In the small intestine, hyperæmia commonly exists, and often swelling of the solitary glands and Peyer's patches. Aside from the adynamic type of remittent, which may depend upon unfavorable surroundings or feeble

constitutional powers of resistance, it seems probable that the tendency to intestinal localisation may in some instances render a malarial patient peculiarly susceptible to the infection of true enteric fever; in others, that the glandular implication may simulate the symptoms of a somewhat irregular dothineritis, especially when exogenous septic agencies co-operate.

A group of cases illustrating these different types has occurred in a sort of basin at the southern juncture of York avenue and Brighton avenue. The drainage of this neighborhood originally found its way to, and through, the valley of a brook running eastward to the bay; but the processes of grading and filling in have left an altogether insufficient outlet, converting a number of sunken lots into what was formerly popularly known as the "duck pond." A cluster of ill constructed houses inhabited by persons of the poorer class, occupies this unfavorable site, where malarial disorders are perennial. In the lower part of York avenue several cases have occurred in which malarial remittents were accompanied by the phenomena of genuine enteric fever. These cases, arising in different households, have had, as far as I could discover, the common link of drinking water from a certain well on the west side of the avenue, situated on the edge of the sidewalk so that its stonework forms part of the kerb. The sewerage from an adjacent house is discharged through a soil pipe directly into the street-gutter, forming a stagnant pool in front of the well. A sample of the water examined October 27th, was turbid with earthy admixture; contained a small amount of organic matter in solution, and a trace of chlorine (this sample was not analyzed, as it is my custom to make a preliminary test with the old standard solution of potassium per-manganate, and if this be not decolorised within an hour, to make no more minute analysis, except in special cases.) Microscopic examination of the deposit showed, in addition to much mineral matter, amorphous decaying detritus, ciliated infusoria (paramecium, chilodon monas,) numerous micrococci, single or in chains of two or three, and rod-bacteria. Some of the mud from the side of this well, treated as an "artificial marsh," exhibited englera, naricula, etc.; infusoria in myriads; numerous leech-like animalculi, and swarmed with micrococci, chain and rod-bacteria and actively moving bacilla.

Two circumstances are noticeable in this connection: First, that the amount of organic matter revealed by chemical analysis in drinking-water, is not necessarily a measure of its unwholesomeness, the quality (which we have as yet no means of determining) rather than the quantity of pollution, being the essential element of pythogenesis; and, second, that the effects of even highly contaminated water are not alike manifested in all who consume it. Examples abound, on the one hand, of people habitually using with impunity water which the analyst would unhesitatingly condemn, and, on the other, of serious outbreaks of disease unmistakably traceable to water not below the commonly accepted standard of purity. Analytical methods deal chiefly with the products, not the processes, of decomposition; and it is possible that infective microzymes may find conditions for multiplication where the quantity of organic matter is very small. The microscope gives promise of greater future utility in this respect, but in our ignorance of the specific character of micro-organisms its indications are as yet uncertain.

In the instance under consideration, although minor digestive derangements are reported to have been common among the families supplied

by the suspected well, the marked typhoid examples seem, as far as I can learn, to have occurred in persons already suffering from malarial fever.

Another public source of water supply, in this neighborhood, is an open well in a sunken lot, between York avenue and Jersey street, exposed to surface washings of every kind. Ducks, goats and other animals roam at will about its margin, which is not above the level of the surrounding earth. The water from this well, although containing but little dissolved organic matter or chlorine, and without appreciable trace of nitrates, yielded a small deposit of decaying animal and vegetable substances, with numerous filamentous algæ, ciliated infusoria, rod and chain bacteria and bacilli; significant of house washings were borula spores and a few indigo-grains.

Beside the typical enteric cases, apparently confined to five houses in the vicinity of the first-mentioned well, a number of examples of "typho-malarial" fever (ten or twelve, at least, though the returns are incomplete) have occurred in this region. These seem to have been adynamic remittents with, in most cases, intestinal complications; but without the temperature-curves, eruption, or other distinctive signs of true typhoid. The environment of the cases within my knowledge was sufficient to account for both malaria and filth-poisoning. At a small cottage in a cul-de-sac, called Eleventh street, wherein a fatal case had taken place, a leaking cistern, open at the level of the ground and loaded with decaying vegetable matter and surface washings, was close to the rear wall of the house. The basement flooring, laid with open crevices upon the damp earth, was rotten in many spots, and the greater elevation of the ground in front precluded ventilation. The street-gutter was offensively filthy with garbage and house refuse.

In Twelfth street, an adjacent blind alley, three cases had occurred in two houses. On an elevation just in the rear of these was an ill-kept cow-stable, under which was a pool of urine and manure, whilst the washings of the surface filth descended in rivulets upon the premises below. Not far from here, on Brighton avenue, where three other cases had arisen, was another cow-stable, containing fourteen cows, soakage from which leaked toward the infected houses. Under this stable was a foul lake of urine and drippings, the outflow from which trickled across the sidewalk into the street gutter, which also served as a receptacle for household refuse. A filthy stable-yard and shed were immediately in the rear of these premises and upon higher ground. In the neighborhood thus described sporadic cases of diphtheria have arisen for several years past, and scarlatina is now reported to exist.

Along the northern declivity of Jersey street the sanitary conditions are extremely bad. This is the most densely populated part of New Brighton, many of the tenements being occupied by different families on each floor. Surface-washing and soakage from privies and cess-pools on the higher ground of York avenue have for years been saturating the soil on its western side, and to the general pollution it contributes a number of its own foul, and sometimes overflowing privy vaults. In addition the sewage from almost every house is discharged through pipes emptying directly into the street gutter. Very recently the street was macademized, and the gutters relaid; but in the new kerbing openings were made to give exit to these house-drains, in violation of a village ordinance, as well as of a regulation of the Board of Health.

In the lower portion of the eastern side of Jersey street the outlet from a small factory pond passes through the cellars of a row of houses, receiving the sewage and excreta of each in its course. Through untrapped privy-seats, and other house-openings into this foul trench its sickening effluvia have egress into the apartments above. Scarletina, diphtheria, typhoid, erysipelas, pernicious intermittent, and cerebro-spinal fever have occurred at intervals along this thoroughfare, and the consumption rate is high.

A localized endemic of typhoid fever at Mariner's Harbor (where, in a small group of houses, cases have arisen at intervals for two or three years past), is connected with excremental pollution of a well used in common. Three privy-pits are within easy leaching distance of this well, the water of which is loaded with organic matter and chlorine. I can learn of no importation of the disease, which seems to have been of local pythogenic origin.

"Typho-malarial" and adynamic remittent fevers, interspersed with cases of true typhoid, have arisen along the line of the "Port Richmond Ditch," a foul conduit, receiving the sewage and excreta from a number of houses in a populous neighborhood. Many of the houses have direct communication with this ditch through inside water-closets, diphtheria and filth diseases of various kinds have frequently shown themselves here.

About the more sparsely-built settlements at and near Springville and Long Neck, the proximity of the vast alluvial marshes, and the general saturation of the low-lying meadow land sufficiently account for the prevalence of severe and intractable paludal fevers and chronic malarial toxæmia. Scattered cases of enteric fever in these districts have, in all instances which could be investigated, seemed attributable to excremental pollution of well-water from adjacent privy-pits. Such cases have been of annual occurrence for some years past, and I cannot learn that their frequency during the present year has been more than proportionate to the increase of population.

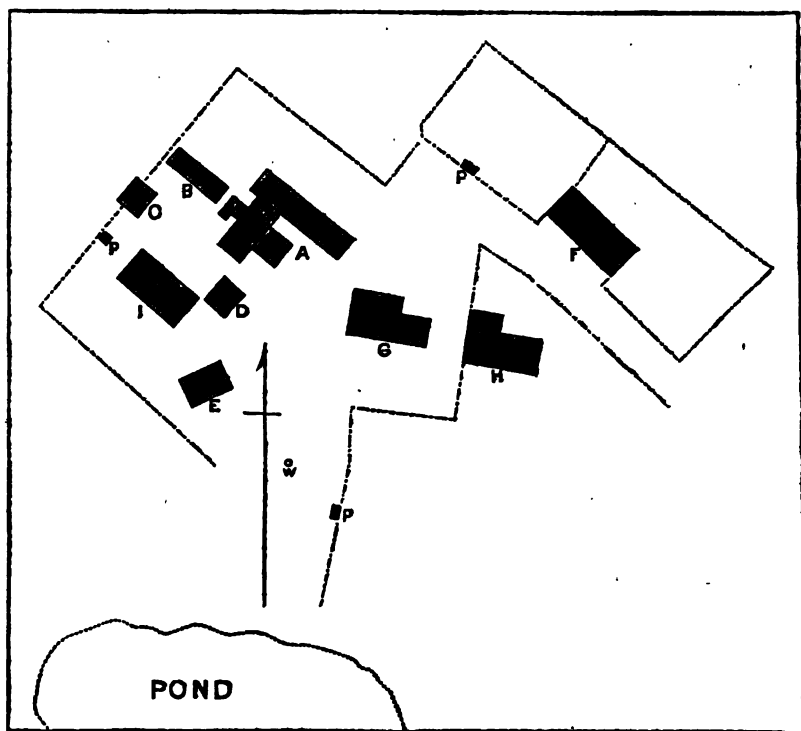
The relation between the fluctuations of the ground-water and out-breaks of typhoid, observed by Pettenkofer at Munich, has not held good in many other places. It is only where the ground-water level serves as an index of the moisture of the superficial strata of soil that such pathogenetic correspondence is verified, and for most practical purposes, in this respect, sanitary geology might terminate with the first impermeable stratum. Over the greater part of Staten Island this retentive layer is very near the surface, and alternate submergence and exposure to decomposition of superposed organic substances may be caused by transient conditions of surface evaporation or slight rainfall, which could have little effect upon the deeper water-level.

A reported epidemic of typhoid fever at Mr. Tysen's canning factory, near New Dorp, to which much notoriety was given by newspaper articles, has been made the subject of special investigation. The factory and accessory buildings are situated upon a knoll about sixteen feet above the surrounding flat-land, the total elevation above sea-level being about twenty-five feet. This part of the town of Southfield lies beyond the margin of the glacial drift, immediately upon a cretaceous bed of tenacious clay, underlaid by sand. The average depth to ground-water is about twenty-two feet. Extensive alluvial marshes reach from the Lower Bay to within a short distance of the premises.

A few rods from the base of the knoll is a pond, which receives the drainage and effluent water from the factory, containing much vegetable matter in suspension. In such a situation all the conditions for malaria are present, and through that region of country intermittents and remittents have long been common, more than ever prevalent during the past summer and autumn, and often assuming an adynamic type or complicated with dysenteric symptoms. Three cases of typhoid fever are reported to have occurred in the summer of 1880 in the neighborhood of New Dorp, but none upon or near the factory grounds until this year.

The accompanying diagram, made by Mr. T. A. E. Busteed, engineer of New Brighton, shows the relative positions of the buildings occupied by Mr. Tysen, who employs from 150 to 200 hands during two months of the year; the number varying with the exigencies of the season, which ends with the first frost. Many of these are men who return year after year; others are engaged as unskilled laborers for short periods, sometimes from employment agencies, oftener, as I am informed, on their voluntary application. No children are employed, and but two women.

The sleeping quarters are in the upper story of the farm-house, in the



loft over the dining room, and in a special loft raised upon joists about eight feet above the ground. This year, I am told, a number of extra hands were temporarily engaged, who slept in the hay-loft over the barn.

The smallest of these lofts (I) afforded about 250 cubic feet per head for fifty men (the greatest number, I am assured, ever occupying it), and its aggregate air-opening—four windows, entrance gangway, and roof ventilators—would allow a movement of from 5,000 to 6,000 cubic feet per minute with a velocity of one and one-half feet per second. The disposal of excreta is by means of shallow privy trenches, the seats being open at the back so as to give free ventilation. Carbolic acid is sprinkled about and the excrement covered daily with dry earth, the compost being removed at intervals to the manure heap, of the barn-yard. These privies are at the base of the knoll, on lower ground than any of the inhabited buildings. It has, however, as I learn, been common among some of the men, especially at night, to ease themselves anywhere about the premises. The water-supply is from a well under the factory roof, and is exceptionally pure. The fare seems to have been ample in quantity and, as far as I can gather from the preponderance of somewhat conflicting testimony, reasonably good in quality. On the one hand, eight or ten of the patients whom I saw at the Ward's Island Hospital found fault with the kind and cooking of their food at New Dorp, and, on the other hand, I have the depositions of between fifty and sixty of Mr. Tysen's workmen and neighbors as to the abundance of fresh provisions. At the time of my own visits the table was plentifully supplied.

The only grave sanitary defect upon the premises lay in the sleeping arrangements. Bunks, separated by board partitions on the floor of the above described lofts, were filled with straw covered by blankets; and this bedding was left unchanged for weeks, soiled sometimes by the carelessness of the occupants. Many of the transient hands have been of the poorest class of immigrants, dirty in their personal habits and destitute in their circumstances; fitting subjects for severe malarial attacks under the vicissitudes of weather to which their work necessarily exposes them. The sudden transition from privation to full diet, aided in some instances by over indulgence in beer, has rendered diarrhoeal disturbances common among these new comers, and increased the difficulty of tracing more serious disease to its origin.

From Dr. Millspaugh, Mr. Tysen's medical adviser, I learn that until the present year no graver illness than ordinary malarial fever has arisen among the men employed; that, this summer, cases were more frequent, "mostly simple intermittents, a few remittents of a somewhat severe type, and still fewer running into a low malignant typhoidal form, with some abdominal tenderness, red and dry tongues, delirium, etc." But one case of dysentery was seen by Dr. Millspaugh on the premises. No instance of marked enteric fever came to his notice until the latter part of August; but the importation of the infection seems to have been due to one of two immigrants who came to the factory on July 22, homeless and penniless. Both of these men are described as suffering on their arrival from languor, diarrhoea, and feverishness, unable to do a full day's work, and they made but a brief stay. I have been unable to ascertain any thing more definite of their history than that one of them had been lodging in casual Greenwich street cellars, and that the other came from the lower part of Orchard street. I am informed by Dr. Nagle, of the New York Bureau of Vital Statistics, that typhoid fever existed at 73 Orchard street.

In the early part of August a man who had been on the place and in

good health for three months was taken with lassitude, fever, diarrhoea, in short, from his own account, with all the symptoms of "walking typhoid," but continued at his work for a fortnight or more, and was only confined to his bed for about a week. This patient's step-brother, who slept next him, sickened soon afterward, and his case being (the first) recognized as typhoid, he was removed to the county hospital, where he died September 11th. Four other cases arose at brief intervals. One was admitted to the Smith Infirmary where he died of undoubted typhoid; the others were treated on the premises and recovered. These latter Dr. Millspaugh regarded as adynamic remittent rather than true enteric fever. One man is still ill at the county hospital with adynamic remittent.

At the State Emigrant Hospital 28 patients have been received who had worked at Mr. Tysen's factory, the dates of admission ranging from September 8 to November 15. Of these there were six cases of enteric fever with four deaths, admitted between September 8 and October 29; one doubtful, complicated with measles, on September 13; four of dysentery, with one death, between September 20 and October 29; the remainder (none fatal) being malarial fevers, ranging from simple intermittent to adynamic remittent or quasi continued.

As far as I have been able to localize the cases (starting from the assumed importation on July 22) the first three occurred in loft I; the fourth in loft H; the fifth in the hay-loft F; the sixth in the farmhouse G; the seventh in loft I; the eighth in loft H; the ninth in the hay-loft; the others (being either dead or discharged from Ward's Island) could not be traced. Among so many men closely quartered together and negligent of cleanliness, their clothing and bedding often soiled with excreta, the extension of the disease is easily accounted for; indeed, it is rather surprising that the epidemic was of such limited character. On the occasion of my first visit, on November 12, I found one man with the commencing eruption of confluent small-pox. He was, as soon as practicable, removed by order of health officer Clark, of Southfield, to the isolation hospital at the poor-house where he died three days afterward. No subsequent cases have been reported. This patient had arrived ten days before I saw him, from 32 Greenwich street, at which place I learn from the records of the New York Health Department that four other cases of small-pox had been discovered between October 28 and November 4. In view of the dangerous part taken by lodging-houses of this sort in the dissemination of variola, I would urge the importance of thorough vaccination of all immigrants before landing. This could be done at Castle Garden as regards persons who have not been detained at quarantine.

An outbreak of diphtheria among children attending one of the public schools was recently brought to the notice of the New Brighton Board of Health. The first case occurred on November 1st, in the person of a girl who had not, as far as could be learned, been exposed to any other source of infection, and whose home surroundings were free from sanitary defects. No previous cases had been reported in the neighborhood. On November 16, three cases were reported in another neighborhood; two on the 18th; two on the 22d; one on the 23d. All these children were pupils of the school, and all except one were in the same room. Mr. Clarence Barrett was requested, as an expert, to examine the premises and reported as follows:

To the Honorable Board of Health of New Brighton:

GENTLEMEN:—In compliance with your request I examined, on the 29th inst., the buildings and grounds of District School No. 4, Castleton, and found the following sanitary defects:

1. No provisions have been made whatever for the ventilation of the basement and first floor of building, and the same can be said of the second or upper story, with the exception of a shaft leading above the roof from one room and hall. This shaft only opens to the north and south. In some of the rooms there are less than 225 cubic feet of air to each occupant.

2. A part of the basement (which is damp) is occupied as living apartments by the janitor; the odors of cooking and the foul air of these sleeping rooms pass through the halls into the school rooms above.

3. The heating furnaces (two in number) are supplied with fresh air from the north side of the building only. And the one in use in the easterly end of the building takes air also from a room in the basement which is occupied as a sleeping room.

4. Water closets (pans) closely encased and emptying into a horizontal pipe placed under the floor. These closets are without any ventilation, are improperly flushed, the inner chambers are foul, and the odors and gases from them must pass up the stairway into the building.

5. On the east end of the building there is attached a small building furnished with hopper closets, which are used by the scholars. This building is not properly ventilated and the water supply (which is ample) is not arranged so as to keep them clean or remove the filth from each bowl and drain.

6. The storm water from the roof is carried under ground, and I am informed supplies cisterns which overflow into the sewer. And I am also informed that there are three old cesspools which are not in use and which have not been cleaned or disinfected. I could not, without uncovering these cisterns and cesspools as well as their connections, say positively that such is the case.

Yours respectfully,

C. T. BARBETT.

WEST NEW BRIGHTON, 30th Nov., '81.

Two years ago diphtheria was alleged to have originated in the same school, and I then reported [Trans. N. Y. State Med. Soc., 1879, p. 536] that:

"A fatal defect in this building lies in the arrangement of the water closets and urinals, which are placed in the basement, connecting with a cesspool about 50 feet from the house; there is no provisions for ventilating the waste-pipes, and the escape of malodorous gases from the closets is very offensive. Stairs leading from these closets to the school room floor invite the ascent of noxious vapors to the upper part of the building, especially in winter when the artificially warmed inner air creates an upward draught; moreover, to make matters worse, a hot-air flue from the furnace passes through the ceiling of the boys' water closet into a school room directly overhead."

The result of numerous investigations has been to convince me that excremental pollutions of air or water is the most frequent source of diphtheria. In thinly inhabited districts, where it was possible to exclude any importation by persons or fomites, I have repeatedly seen the

disease arising when one of these two factors afforded the only possible explanation of its origin. A marked illustration of its connection with impure drinking water happened in an isolated house at Castleton Corners wherein fifteen children from the nursery and child's hospital were boarded. Between June 4 and 7 nine cases of diphtheria appeared in this household. On careful inspection no insanitary conditions could be found save in the well water, which bore evidence of sewage contamination. Cistern water was substituted, and no new sickness arose until the beginning of August, when the cistern became exhausted and a recurrence to the well was followed by a severe case of diphtheria and several of pharyngitis. Instructions were given to boil the water before using it and since then no fresh cases have occurred.*

The village trustees of Edgewater, having discovered that their charter confers upon them the powers of a board of health, not only refuse, despite the solicitations of a committee of the Richmond County Medical Society, to fulfill the requirements of the State act, but resist the interference of the town Board of Health. The village is thus without any pretense of efficient sanitary organization; without even the nominal appointment of a health officer; and no measures seem likely to be taken to abate many conditions in the highest degree detrimental to health. No registration of deaths or diseases is made, but from personal inquiry I have learned of the prevalence of typhoid and diphtheria in several localities, especially in the undrained and filth-sodden district about Gore and Gowden streets at Stapleton. This district and other insalubrious features of Edgewater were described in the report of the Metropolitan Board of Health for 1869, since when few of the evils then existing have been rectified, whilst others have been created with the increase of population. In one place an open trench, bearing the surface washing from the adjoining high ground of Castleton and receiving sewage from a pig sty and privy on its way, is carried under the Richmond road and continued through the yards of the opposite houses, within a few feet of the windows, its stench being very offensive. Two cases of typhoid fever and one of diphtheria have occurred within a fortnight in one household on the line of this branch, and I am informed that other cases have occurred in the vicinity.

In concluding this incomplete and necessarily desultory recital of the few sources of endemic disease which have thus far come within my observation, I have only to reiterate what has again and again been taught: that such sickness and death belong to the preventable class, and that the expenditure needed for their prevention would be the most profitable of investments. The impediments to sanitation on Staten Island are nowhere insuperable; indeed, in the most mischievous examples they are of human invention. The household is, of course, the starting point of all sanitary improvement, and until the people at large can be educated in the principles of home hygiene, there will always be scattered instances of illness from domestic causes. But all precautions of the householder are in vain unless the external conditions of public health be provided; and these require, in the built up portions of the villages, sewerage, and, everywhere, attention to soil-

*An account of this and other groups of diphtheria in which exposure to contagion bore no part will be found in a paper by Dr. M. A. Avery, of the Nursery and Child's Hospital, read before the Staten Island Clinical Society.

drainage. In respect of the latter desideratum, to reconcile the separate and sometimes conflicting autonomies of contiguous townships and villages, as well as to prevent further detriment from injudicious public or private operations, the intervention of the State Board of Health — at least in an advisory capacity — might be of the utmost benefit, by determining and defining the natural drainage channels which it is necessary to preserve in all future grading. Most of the topographical data for such a scheme are already accessible, and the few additional surveys needed could be obtained without much expense.

INVESTIGATION CONCERNING CAUSES OF AN OUTBREAK OF FEVER AND DYSENTERY AT NEW DORP, STATEN ISLAND.

The following communication from the Commissioners of Emigration was referred to the State Board of Health by request of the Health Department of the city of New York, and as it was immediately brought under Dr. Carroll's study, his report follows the original complaint made by the Commissioners of Emigration:

November 11th, 1871.

To the Commissioners of the Health Department:

GENTLEMEN: — I am directed by the Commissioners of Emigration to lay before your honorable Board the following extracts from a report made by Dr. Schultze, physician at the State Emigrant Hospital, Ward's Island, in reference to the unhealthy condition of the tomatoe canning factory situated at New Dorp, Staten Island, and to request that you will take action thereon:

"Mr. Tysen employs during the months of August and September about 200 men, recently arrived immigrants, mostly and principally Germans who do not understand the language. Within the past two months we have received into this hospital from 40 to 50 men who had been employed at Tysen's factory. At present we have of these 30 patients who are under treatment, some suffering from typhoid fever and others from dysentery in its severest form. The patients all complain bitterly of the treatment they received. Four patients recently died here who took the fever at the factory."

Very respectfully,

H. J. JACKSON, *Secretary.*

Dr. Carroll's Report.

To Secretary State Board of Health:

DEAR SIR: — Respecting the alleged outbreak of pythogenic fever at Mr. Tysen's canning factory at New Dorp, Staten Island, my inquiries have been beset by many difficulties and delays, owing to the dispersion of most of the operatives at the end of the business season, which terminates with the first frost; and my investigation is not yet so complete as I hope soon to make it. From the facts already in my possession, however, I feel warranted in presenting the following brief preliminary report:

The cluster of buildings used by Mr. Tysen stands upon a small knoll about sixteen feet above the surrounding flat land, the total elevation above sea level being about 25 feet. This portion of the town of

loft over the dining room, and in a special loft raised upon poles about 8 feet above the ground. This year, I am told, an extra number of men were temporarily employed, who slept in the hay-loft over the barn. The smallest of these sleeping-lofts afforded about 250 cubic feet per head if containing fifty men (the greatest number, I am assured ever occupying it), and its aggregate air openings would allow a movement of from 5,000 to 6,000 cubic feet of air per minute with a velocity of one and one-half feet per second.

Many of the transient hands have been of the poorest class of immigrants, dirty in their personal habits and destitute in their circumstances; poorly clad and half starved on their arrival, and fitting subjects for severe malarial attacks under the vicissitudes of weather to which their work necessarily exposes them. The sudden change from privation to full diet, aided in some instances by over indulgence in beer, has rendered diarrhœal disturbances common among these new comers, and increased the difficulty of tracing more serious disease to its origin.

The disposal of excreta is by means of three shallow privy-trenches, the seats being open at the back so as to give free ventilation. Carbolic acid is freely used, and the excrement covered daily with dry earth, the compost being removed at intervals to the manure heap of the barn yard. These privies are at the base of the knoll, sufficiently distant from the inhabited buildings. It has, however, as I learn, been common among some of the men, especially at night, to void themselves anywhere about the grounds.

The water-supply is from a well under the factory roof, and is exceptionally pure. The fare seems to have been ample in quantity and, as far as I can gather from the preponderance of somewhat conflicting testimony, reasonably good in quality.

The only markedly insanitary condition, aside from the personal uncleanliness of many of the men, lay in the bedding arrangements. Bunks, separated by board partitions on the floor of the above described lofts, were filled with straw covered by blankets, and this bedding was left unchanged for weeks, soiled sometimes by the carelessness of the occupants.

From Dr. Millspaugh, Mr. Tysen's medical adviser, I learn that until the present year no graver illness than ordinary malarial fever has occurred among the men employed. This summer, there as elsewhere, cases were more frequent "mostly simple intermittents, a few remittents of a somewhat severe type, and still fewer running into a low malignant, typhoidal form, with some abdominal tenderness, red and dry tongues, delirium, etc." But one case of dysentery was seen by Dr. Millspaugh on the premises, though this and diarrhœa have been prevalent throughout all that section of country. Two deaths from enteric fever (the first on September 11th) and one from small-pox comprise the mortality among the employes here. One man is reported convalescing from what appears to have been a mild and unrecognized typhoid, and another is still ill at the county hospital with adynamic remittent.

The importation of the specific typhoid and infection seems to be due to two immigrants who came down to the factory on July 22, homeless and penniless. Both of these men were suffering with languor,

diarrhœa, and feverishness, unable to do a full day's work, and made but a brief stay. One of them had lodged in casual Greenwich street cellars, the other in Orchard street. These cases I am endeavoring to trace more definitely. In the early part of August another man, who had been on the place for three months, was taken with diarrhœa, lassitude, fever, in short, from his own account, with all the symptoms of "walking typhoid." He continued at his work, however, for a fortnight or more, and was only confined to his bed for about a week. This patient's step-brother, who slept with him, sickened next, and his case being recognized as typhoid he was removed to the county hospital, where he died on September 11th. Four other cases arose at brief intervals. One was admitted to the Smith Infirmary where he died of undoubted typhoid; the others were treated on the premises and recovered. These Dr. Millspaugh is inclined to regard as adynamic remittent rather than true enteric.

At the State Emigrant Hospital 28 patients have been received who had worked at Mr. Tysen's factory, the dates of admission ranging from September 8th to November 15th. Of these there were six cases of enteric fever with four deaths, admitted between September 8th and October 29th; one doubtful, complicated with measles, on September 13th; four of dysentery, with one death, between September 20th and October 29th; the remainder (none fatal) being malarial fevers, ranging from simple intermittent to adynamic remittent or quasi continued.

All the cases and dates of enteric fever thus obtained conform with the opinion that the infection was imported on the 22d of July. Its extension is easily accounted for by the soiling of bedding and clothing with typhoid excreta; indeed, it is surprising that so few cases should have occurred among so many men closely quartered together, and negligent of cleanliness, and the limited character of the outbreak argues against local pythogenesis.

On the occasion of my first visit, on November 12th, I found one man showing the commencing eruptions of confluent small-pox. He was, as soon as practicable, removed by order of health officer Clark, of Smithfield, to the isolation hospital at the poor-house, where he died three days afterwards, and fumigation and vaccination were practiced by Dr. Millspaugh. No subsequent cases had occurred up to the 26th inst. This patient had arrived ten days before I saw him, from lodgings at 32 Greenwich street. From inquiries which I have made as to the dissemination of small-pox through such lodging houses, I am led to urge the importance of having a vaccinating station at Castle Garden, where every immigrant can be protected on landing. As it is, many unvaccinated persons are necessarily passed through the quarantine department without detention.

Further and more exact data will be given in a more detailed report which I hope to forward in a few days, when I shall have examined the suspected sources of infection.

I have the honor to be, sir,

Your obedient servant,

ALFRED D. CARROLL, M. D.

WEST NEW BRIGHTON, Nov. 29, 1881.

SPONTANEOUS OUTBREAKS OF TYPHOID FEVER IN A MOUNTAIN DISTRICT OF ESSEX AND WARREN COUNTIES.

The following brief account is contributed by Dr. Cooley, who ascertained the facts while upon his investigation of diphtheria in Schroom, Johnsburch and Minerva.

James Ford occupied, with his family of eight, a house in a low, swampy place near the former site of a tannery, burned a few years since. The well, from which water is procured for use by the family, is in the woodshed attached to the house. The slops are thrown upon the ground back of the well, and the privy is some three or four rods distant from the well. The cases of fever in this family were as follows :

Michael,	aged 21,	taken Sept. 8,	1880,	recovered.
Maggie,	" 16,	" Dec. 1,	"	died in 10 days.
John,	" 18,	" Jan. 8,	1881,	recovered.
Mrs. Ford,	" 45,	" " 21,	"	"
James,	" 8,	" " 22 or 23,	1881,	recovered.

The source of the trouble in the case of Michael is unknown at present. The unsanitary surroundings of the premises leave little room for doubt that the others contracted the disease in consequence of the first case. These facts are due to Dr. J. C. Wall, of Olmsteadville, who attended the family.

Typhoid Fever in Johnsburch :—Dr G. R. Martine reports eighteen cases of typhoid fever in 1881. All were not well marked, but all had more or less of the typhoid symptoms and were of long duration. No two of the cases were in the same house, and no cause has, as yet, been ascertained for the attacks. Both sexes and all ages from 4 to 36 years of age, and in one case of 60 years, had the fever. The number of deaths was four (4). Most of the families where these cases occurred obtained their water from wells, and the dwellings were situated from 20 to 100 feet above the bottom of the valley. In no case was there any thing certain that would indicate a propagation of the disease from one to another, and as but one case occurred in a house, they were all probably idiopathic.

Respectfully submitted,
JAMES S. COOLEY, M. D.

LUZERNE, N. Y., Jan. 19, 1882.

THE SANITARY PAPERS RELATING TO THE PREVENTION AND CONTROL OF CONTAGIOUS DISEASES.

The series of papers issued under the above heading for general distribution, have all been printed upon single sheets or leaflets, and as they are in untechnical phrase, and have proved to be of great utility, the Board has directed their republication in this place.

[No. 13.]

STATE BOARD OF HEALTH OF NEW YORK.

HINTS FOR PREVENTING DIPHTHERIA.

This brief memorandum of sanitary duties is designed for use of families and communities exposed to diphtheria, and is published by the State Board of Health to aid in the repression and prevention of this terrible disease.

Issued by order of the Board,
ALBANY, *March*, 1881.

EDWARD M. MOORE, M. D.,
President.

ELISHA HARRIS, M. D.,
Secretary.

Diphtheria is an infectious and dangerous disease, readily communicated by the sick and by clothing from the sick-room. The room itself is apt to retain and communicate the infection. Its spread is prevented by great care to have the sick, their clothing, and the persons who nurse them, kept entirely away from others, especially from children : and to such care should be added cleansing.

The sick must be nursed in a clean and airy room, on a floor where there are no other children.

Every cloth and cup, and all clothing and bedding used in the sick-room, must be cleansed and disinfected before being handled or used by other persons. The house itself must be disinfected as soon as the sick recover or die. Cleanliness and ventilation should be enforced night and day.

The Cleansing and Disinfection.*—Open windows, and open fire-places—with fire in them day and night—protect the sick and all who attend them. The cloths and dishes used by the sick should be put into boiling-hot water, as soon as removed, without being taken to another room. The soiled clothing from the sick and the bed, that can be boiled, should be thrown into a disinfecting fluid, made by dissolving four *table-spoonsful of sulphate of zinc* ("white vitriol"), and two table-spoonsful of common salt in a gallon of boiling water (one-fourth pound of sulphate of zinc to two ounces of table-salt to the gallon). When the time for washing comes, thoroughly boil the clothing, etc., before washing.

The woodwork, chairs and stools of the sick-room should be washed with the disinfecting fluid. The chamber vessels and spit-cups, used by the sick, should be drenched with this fluid before they are removed from the room.

The grounds surrounding the house, the ditches and drains and the privy and chip-yard, must be drenched with the cheap solution of green copperas (sulphate of iron), made by dissolving five pounds of the dry copperas in a large pailful of water.

As soon as the sick-room is vacated let it be fumigated with sulphur, and let all rugs, beds, blankets and other furniture remain in the room and near where the kettles or pans of sulphur are placed. From two to five pounds of sulphur, or broken brimstone, laid upon ashes and coals in iron vessels (set into large tubs that contain a few inches depth of water), will be necessary for fumigating an ordinary chamber. The physician will direct how to do this; but it will be well done if the rooms to be fumigated are so closed that the suffocating fumes do not escape from flues and crevices, and the burning of the sulphur at last ceases for want of fresh air before all the sulphur is consumed. Let the fumes be kept shut in all day. Finally, let all plastered portions of the room be well white-washed with fresh-slacked lime. Let the bottom and sides of cellars be sprinkled thickly, and repeatedly, with quick-lime. All house-drains, ditches, filthy grounds, garbage-tubs, and decaying materials should be cleared out and disinfected, and waste-pipes, drains and sewer connections so improved that no gases from them shall enter the house.

The sick should be nursed by adults who have no children about them. Avoid the patient's breath and matters ejected in coughing.

Children and visitors should keep away from the house where there is diphtheria. The burial of those who die should be strictly private. The corpse should be wrapped in a sheet saturated with the zinc disinfectant.

Children who recover from diphtheria should not visit or be visited, attend school or meetings, nor mingle with others of the family from which separated, until the physician permits.

The mother, father or other member of a family, who needs to become the attendant upon the sick when quarantined for diphtheria, should

* See card of Instructions on Disinfection.

Note.—Perfect drainage and cleanliness, thorough ventilation and dryness, and repeated disinfection of all the house drains and foul places are necessary, to the safety of the family and the neighborhood.

Ask your physician to notify the local health officer of the occurrence of diphtheria, also to inform the State Board of Health concerning the cases and discovered causes.

practice all possible precautions to prevent spreading the infection in the family. Nurses of such patients should keep away from other families and from other children of the same family.

It must be remembered that not only the mild cases, but the convalescent, may and frequently do infect others fatally, and that by this means diphtheria is thoughtlessly spread from place to place.

It is a public as well as domestic duty to apply these Sanitary Rules wherever a case of diphtheria occurs. This disease should be treated as an enemy to be conquered in every house it enters.

[No. 14.]

STATE BOARD OF HEALTH OF NEW YORK.

SANITARY RULES FOR PREVENTING SCARLET FEVER.

The State Board of Health of New York directs this Memorandum of Instruction and Rules to be issued for the benefit of families and neighborhoods throughout the State. The card of Instructions on Disinfection accompanies this.

ALBANY, *March*, 1881.

EDWARD M. MOORE, M. D.,
President.
ELISHA HARRIS, M. D.,
Secretary.

Scarlet fever is an infectious and dangerous disease. The mildest case may spread its fatal infection, and cause the most malignant cases.

The danger of communicating this disease continues during convalescence as well as in the height of the fever. Whatever is discharged or comes from the patient is liable to infect persons who have not had scarlet fever. The clothing, furniture and the air of the sick-room may impart the infection. Clothing, bedding, closets and closed rooms may retain the infectious poison for a long time. Strict sanitary rules are urgently required on this account.

Parents, teachers, school officers and all persons who have the care of children can do much to guard against the occurrence of infection, and they frequently are responsible for the spread of scarlet fever. The State Board of Health appeals to all who are thus responsible to do whatever they can to prevent this disease. This is to be attempted by the isolation or quarantine of the sick, and by disinfection, cleansing and ventilation.

ISOLATION AND QUARANTINE OF THE SICK.

The sick with scarlet fever should be placed in an upper room with the best ventilation, and kept secluded from all except those who have charge of the case.

Children in the family not affected must be prevented from mingling with other children, and especially must be kept from schools and meetings. Children of other families in the same house should submit to this rule, yet it is earnestly recommended that uninfected children be sent away from the house in which there is scarlet fever, to families in which there are no persons liable to the disease.

Infected Materials.—Carpets, curtains, trunks, clothing and all stuffed furniture and bedding should be removed from the room, and the part of the house in which the sick, or dead, with scarlet fever are to be placed.

The contagious matter thrown off from the surface of the patient's body is to be controlled as much as possible by such anointing of the body with oil, vaseline or lard as the physician may direct, and especially by disinfecting all discharges as they issue from the patient, and placing all clothing, towels, etc., removed from the sick, immediately in the disinfecting fluid of zinc-salt.

Disinfection.—Apply the methods and means described in the circular on disinfection. Follow the same rules as for diphtheria. The disinfectant made by dissolving one-fourth pound sulphate of zinc and two ounces of salt in a gallon of water is the best and cheapest.

Thorough cleansing and ventilation must be enforced. All drains, sewers and privies about the house should be kept thoroughly disinfected.

Restrictions upon Convalescents.—As the liability to infect others continues as long as there is any desquamation, or peeling of the skin, and possibly even longer, the recently sick should not attend any school, church or company, or ride in a public conveyance while the skin is peeling, the throat and eyes sore, or any symptoms of dropsy are present. A competent physician should decide what special cleansing by warm baths with vaseline-soap or chlorinated washes should be used. In all cases let the physician decide, and certify, in writing, that the patient is safe to others, before any child recently suffering from scarlet fever is permitted to attend school.

Whoever attends upon scarlet fever patients, and whoever enters the room where they are, should not mingle with persons liable to take this fever, without changing all clothing, after thorough ablution of hands and head.

Burial of the dead from scarlet fever should be strictly private, with the corpse wrapped in a sheet saturated with the zinc disinfectant, or inclosed in an air-tight coffin. When a death from this disease is announced in print, the notice should state the cause as "from scarlet fever," to prevent attendance at the funeral or visits to the house.

A destroyer of precious lives, and a most harmful and permanent cause of injury to the bodies of children who survive the attack, scarlet fever must be treated as an enemy of childhood and of the family. We must endeavor to "stamp out" and exterminate the known contagion by which it spreads. Separation, purification, ventilation and disinfection of the sick and all that pertains to them, as well as the rooms and bedding they have occupied, and the special sanitary care of all persons who have been exposed or near to them, are necessary for arresting the spread of this disease. Promptly report all cases of scarlet fever to the nearest health officer, and at once order the isolation and sanitary care of the sick as advised by these rules and the physician.

[No. 15.]

STATE BOARD OF HEALTH OF NEW YORK.

SANITARY PRECAUTIONS FOR PREVENTING THE SPREADING OF INFECTIOUS DISEASES.

The State Board of Health publishes this Memorandum of Sanitary Precautions against the spreading of Contagious and Infectious Poisons, because the most of them can be "stamped out," and all of them can be controlled.

ALBANY, *April*, 1881.

E. M. MOORE, M. D.,
President.
ELISHA HARRIS, M. D.,
Secretary.

Cleanliness and ventilation are in all cases and everywhere of the first importance. The diseases which are spread chiefly from place to place and from person to person by means of their own infection or contagion are to be regarded and treated as enemies, to be resisted and stamped out. The propagation of some of them with the help of local causes, seen or unseen, and the fatality, as well as spread, of each one of them is increased by personal uncleanness and local unhealthfulness. Diphtheria, measles, scarlet fever, typhoid fever, puerperal fever and small-pox are the most pestilent of these infectious diseases in this State. But typhoid fever and malignant cholera are infectious by means of excremental matters rather than from bodily emanations. Typhus spreads by its personal contagion, and it originates among crowded and uncleanly people. These diseases and all infections and contagions require disinfection and all sanitary precautions that prevent infection.

Small-pox, scarlet fever, diphtheria or measles.—The patient should be kept in a separate room (preferably on an upper floor) from which, if possible, carpets, curtains, stuffed furniture, clothing and other articles not required for immediate use should be removed beforehand; and no person except the physician, nurse or parent should be allowed to enter the sick-room, or to touch any of the articles used therein, until after thorough disinfection.

To disinfect clothing, etc., in the sick-room.—Keep in the room a tub containing a quarter of a pound of sulphate of zinc and two ounces of salt to a gallon of water. All bed linen, handkerchiefs, etc., used about the patient should be allowed to soak in this solution for at least an hour before removal from the room and afterward be thoroughly boiled, separate from the rest of the family washing. Never send such articles to a public laundry.

To disinfect discharges from the patient.—Use the same disinfecting fluid as in disinfecting clothing, but three times stronger, or use copperas water, made by dissolving a pound and a half of copperas in a gallon of water. The latter answers for all excremental discharges, while the former is best for all articles of clothing and furniture. All

vessels used in the sick-room should be disinfected with one or other of these disinfecting fluids, unless immediately immersed in boiling water. Disinfect the discharges and clothing immediately.

Typhoid fever.—The poison lies in the discharges from the bowels, which should be at once disinfected with the solution of the zinc-salt or of copperas. Particular care should be exercised to prevent any possible contamination of sources of drinking water with these discharges. Bed clothing or other articles soiled by the evacuations should be treated with the zinc solution and be boiled.

Dysentery and cholera.—Adopt the same regulations as in typhoid fever.

Typhus fever.—Enforce free ventilation, and disinfection of clothing as above described. Attend to the fumigation of the sick-room and its bedding.

To prevent the body of the patient from spreading contagion.—In the eruptive diseases, especially in scarlet fever, the patient's body should be anointed at least twice a day with oil, lard, or vaseline, containing about ten grains of carbolic acid or of thymol to the ounce. This process should be maintained until all bran-like scaling of the skin is at an end. The zinc-salt solution should be used as directed. Before again associating with unprotected persons, the patient should have several complete ablutions, including thorough washing of the hair with soap or borax; and none of the clothing worn for several days before the disease declared itself should be again used until thoroughly disinfected, and ventilated in the open air several days.

Avoid visiting houses where there are any of these diseases.—Occupants of such houses should not visit.

Disinfection of houses and apartments.—Fumigation with sulphur is the only practicable method for disinfecting the house, as well as furniture, bedding, etc., that cannot be steamed or boiled. For this purpose the rooms to be disinfected must be vacated. Close the rooms as tightly as possible, place the sulphur in iron pans supported upon bricks in wash-tubs containing a little water, set it on fire by hot coals, or with the aid of a spoonful of alcohol, and keep the room tightly closed twenty-four hours. For a room of dimensions equal to ten feet square, or one hundred square feet of floor-space, at least two pounds of sulphur should be used; for larger rooms, proportionally increased quantities.

After fumigation, the freest possible ventilation should be practiced. All woolen clothing, silks, furs, stuffed bed-covers, beds, and other articles which cannot be treated with zinc solution should be hung in the room during fumigation, their surfaces thoroughly exposed, and their pockets turned inside out. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be ripped open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten. Many of such articles may be disinfected in an oven or steam-heated tank, at a temperature of from 212° to 250° Fahr., maintained for five or six hours.

Disinfection of premises, etc.—Cellars, yards, stables, gutters, privies, cess-pools, water-closets, drains, sewers, etc., should be repeatedly and profusely drenched with copperas solution, which is easily kept ready

for use, at full strength, by hanging a basket containing about sixty pounds of copperas in a barrel of water, and renewing the supply from time to time.

Corpses should be thoroughly washed with a zinc solution of triple strength; should then be wrapped in a sheet wet with this strongest disinfecting solution, and buried as soon as practicable.

NOTE.—There are no substitutes for cleanliness and fresh air. The deodorizers, which are much used as disinfectants, are deceptive.

Warning against typhus.—The typhus contagion which is being spread by tramps and vagrants, threatens much harm. Each of the twenty cities beyond the metropolis, and local Boards of Health in the 831 villages and the 983 towns of the State, should require their Health Officers to be watchful and ready to adopt all necessary sanitary precautions for isolating and controlling this disease at its first appearance. Tramps should not be permitted to enter dwellings and lodging-houses, as they wander from the cities. They should be cleaned and directed by the superintendents of the poor. Every typhus patient should be so quarantined and provided for as to prevent the spread of infection. All lodging-houses and dwellings should be thoroughly cleansed beforehand; and wherever a case of typhus occurs the disinfection of the clothing, bedding and sick-rooms should be as prompt and thorough as in cases of small-pox.

[No. 16.]

STATE BOARD OF HEALTH OF NEW YORK.

INSTRUCTIONS FOR DISINFECTION

*[As Prepared under the Direction of the National Board of Health.—
Issued by the State Board of Health of New York.]*

Disinfection is the destruction of the poisons of infectious and contagious diseases.

Deodorizers, or substances which destroy smells, are not necessarily disinfectants, and disinfectants do not necessarily have an odor.

Disinfection cannot compensate for want of cleanliness nor of ventilation.

I. *Disinfectants to be Employed.*

- (1.) Roll sulphur (brimstone) for fumigation.
- (2.) Sulphate of iron (copperas) dissolved in water in the proportion of one and a half pounds to the gallon : for soil, sewers, etc.
- (3.) Sulphate of zinc and common salt, dissolved together in water in the proportion of four ounces sulphate and two ounces salt to the gallon : for clothing, bed-linen, etc.

II. *How to Use Disinfectants.*

(1.) In the sick-room.—The most available agents are fresh air and cleanliness. The clothing, towels, bed-linen, etc., should, on removal

from the patient, and before they are taken from the room, be placed in a pail or tub of the zinc solution, boiling-hot if possible.

All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered with copperas solution. All vessels used about the patient should be cleansed with the same solution.

Unnecessary furniture, especially that which is stuffed, carpets and hangings, should, when possible, be removed from the room at the outset; otherwise, they should remain for subsequent fumigation and treatment.

(2.) Fumigation with sulphur is the only practicable method for disinfecting the house.—For this purpose, the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution should be opened and exposed during fumigation, as directed below. Close the rooms as tightly as possible, place the sulphur in iron pans supported upon bricks placed in wash-tubs containing a little water, set it on fire by hot coals or with the aid of a spoonful of alcohol, and allow the room to remain closed for twenty-four hours. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms, proportionally increased quantities.

(3.) Premises.—Cellars, yards, stables, gutters, privies, cess-pools, water-closets, drains, sewers, etc., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

(4.) Body and bed clothing, etc.—It is *best to burn* all articles which have been in contact with persons sick with contagious or infectious diseases. Articles too valuable to be destroyed should be treated as follows :

- (a.) Cotton, linen, flannels, blankets, etc., should be treated with the boiling-hot zinc solution; introduce piece by piece, secure thorough wetting, and boil for at least half an hour.
- (b.) Heavy woolen clothing, silks, furs, stuffed bed-covers, beds, and other articles which cannot be treated with the zinc solution should be hung in the room during fumigation, their surfaces thoroughly exposed, and pockets turned inside out. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

(5.) Corpses especially of persons that have died of any infectious or malignant disease, should be thoroughly washed with a zinc solution of double strength; should then be wrapped in a sheet, wet with the zinc solution, and buried at once.

Metallic, metal-lined, or air-tight coffins should be used when possible; certainly when the body is to be transported for any considerable distance.

NOTE. — These Instructions were prepared at the request of the National Board of Health by Professors C. F. Chandler, Henry Draper, G. F. Barker, S. O. Vander-Poel, E. G. Janeway and Ira Remsen. They combine the best experience with accurate knowledge of the chemistry of disinfection.

The chemicals here recommended are simple, safe and effectual ; they are cheap and can be obtained in every town, and used in the ways here described, they will destroy contagious and infectious matter, and the directions for fumigation, boiling, ventilation, cleansing and drying can be carried out in any house ; but let it be remembered that there are no substitutes for cleanliness and fresh air.

The State Board of Health advises that these instructions be followed.


ELISHA HARRIS, M. D., *Secretary*.

VACCINATION NOTICE.

To whom it may concern:

At a meeting of the Board of Trustees, of School District No. ,
of , N. Y., held , 188 , it was

Resolved (in accordance with the statute entitled "An act to encourage and provide for a General Vaccination in this State," passed April 16, 1860), to exclude from the school any child or person who has not been vaccinated, and until such time when said child or person shall become vaccinated, and in pursuance of said act the said Board has designated (or agreed with) Dr. * to vaccinate all who may desire to attend said school, whose parents or guardians are unable to obtain such vaccination.

 The ten days' notice, required by law, is hereby given.

By order of the Board.

(Signed.)

*Or. with the Health Officer, Dr.....

[No. 17.]

The State Board of Health of New York recommends to the trustees, or board of education, in every school district in the State, that an order be made, and a provision announced, concerning the vaccination that is required by law for the protection of schools against small-pox. The above form of a resolution and posted notice is recommended to all school authorities.

By direction of the State Board of Health.

ELISHA HARRIS,
Secretary.

[No. 41.]

STATE BOARD OF HEALTH OF NEW YORK.

MEMORANDUM OF RULES TO BE ADOPTED TO PREVENT THE SPREADING OF CONTA- GIOUS DISEASES IN SCHOOLS.*

The following sanitary rules are recommended by the State Board of Health for adoption by all School Boards and Trustees. They are presented in a form suited for direct transfer to the Public School Regulations, with the exception of the bracketed [] portions, which may depend on local circumstances for their application or feasibility:

I. Every person entering the public schools of must give satisfactory evidence of protection against small-pox, or be excluded until the rule is complied with, as provided by the statute of 1860. [See synopsis of this statute as appended.]

II. The fact of vaccination and protection should be entered with each name on the school record [and on transfer or promotion lists, so as to avoid further inconvenience to the pupil].

III. Persons affected with diphtheria, measles, scarlet fever, or small-pox, must be excluded from school until the school officer's permission is granted.

IV. Intercourse between the school and family or house where there is a case of any one of these contagions, must be forbidden, until the official permission is given.

V. It will be the duty of every teacher and school officer who discovers a case of any of these contagious diseases, to cause the fact to be immediately reported to the local Board of Health. [The Board of Health should assume the sanitary duty of quarantining and disinfecting, as well as that of permitting the pupil's return, etc.]

VI. If a child is ascertained to have attended school while affected with any of these contagions, the local Board of Health shall be requested to direct the proper disinfection of the school premises. In the absence or delay of such sanitary authority, the physician in attendance, with one of the school officers, should direct this duty in accordance with the rules for Disinfection and Cleansing given in the State Board's Circular, No. 16.

VII. Rule III must invariably include all persons from the family where the case of sickness exists. [It should extend, also, to all persons living in the same house, at the discretion of the local Board of Health.]

VIII. [If there is no local Board of Health, the school authorities, with medical advice, if possible, should decide the question in brackets under Rule VII, and should take the advice and assume the duties mentioned in Rules V and VI.]

IX. [It is desirable that all cases known to the Board of Health

*Extracted from the Second Annual Report of the State Board of Health.

should be at once reported to the school authorities; and the latter should request the Board of Health to do so, and every teacher and school officer not only should promptly inform the health authorities of each known or suspected case of contagious disease, but should endeavor to have the sanitary rules enforced, and give proper information to the families concerned.] In such instances the duties of all these officers and persons are reciprocal, and none can prudently be neglected.

This memorandum is published by the State Board of Health, as information and advice,—earnestly recommended to the attention of all school officers and local Boards of Health; and as this Board has deemed it a duty to consult the State Superintendent of Public Instruction, every interest of the schools has been carefully considered, and the rights and duties of their pupils, trustees and boards of education duly regarded.

EDWARD M. MOORE, M. D.,
President.

ELISHA HARRIS, M. D.,
Secretary.

ALBANY, 1882.

I heartily approve the foregoing, and commend the same to the common school trustees and others who are responsible for the welfare of the schools.

NEIL GILMOUR,
Superintendent of Public Instruction.

SYNOPSIS OF THE STATUTES RELATING TO CONTAGIOUS DISEASES IN TOWNS AND SCHOOL DISTRICTS.

The statute (chapter 438, Laws of 1860) makes the following provisions:

1. The trustees of school districts, and the school boards, are empowered to exclude from the public schools all unvaccinated persons until they are vaccinated.
2. This power may be exercised by trustees or boards, after passing a resolution to that effect and posting a notice for at least ten days in two or more conspicuous places within the limits of their respective school-board or district organizations. Such notice should offer free vaccination to those unable to pay. [The form necessary in such cases is given in the circular (No. 17) of the State Board of Health. That circular has been sent to every school-district clerk in the State.]
3. The trustees or board, are further empowered to employ and pay a physician who shall make a list of all persons within the school ages that have not been vaccinated, and provide with certificates of vaccination those persons whom the said trustees or board directs. The local Board of Health is required, under chapter 431, of 1881, to supply all the necessary means for gratuitous vaccination, and it is declared to be its duty "*to make all needful provisions for immediately obtaining the necessary means for thorough and safe vaccination of all persons within the said jurisdiction who may need the same.*"
4. The amount expended is to be included in the annual tax bill. [The new law enables the town, village or city to meet the expense by its local Board of Health.]
5. The trustees of school-districts are required to include in their

annual report the number in their several districts between the ages of five and twenty-one who are vaccinated, and the number not vaccinated. [Every local Board of Health should require compliance with this law.]

[38.]

STATE BOARD OF HEALTH OF NEW YORK

PREVENTION OF SMALL-POX.

Duties of the Local Authorities — Health Officers and Others.

The State Board of Health, at its meeting December 13, 1881, directed that the health officer and Board of Health in every place where there is small-pox, in this State, shall receive from the secretary of the State Board whatever aid this Board can give for controlling the contagion; and it is required of all health authorities and other persons who know of any outbreak or case of small-pox, that they shall report the facts immediately to the secretary of this Board and to the nearest health officer.

Small-pox is liable to appear in any place where there are unvaccinated persons. It is dangerous to life, and is a misfortune which causes loss and great disturbance in the affairs of any community that does not immediately secure to every inhabitant the necessary protection by vaccination and re-vaccination, and by thorough quarantine and disinfection of the contagion.

The Laws in this State require:—

(1.) That all who are in attendance at the public schools shall present evidence of their being vaccinated; also that after ten days' notice any person may be excluded from school who is not so protected against small-pox. (Chap. 438, Laws of 1860.)

(2.) That it shall be the duty of all local Boards of Health promptly to report to the State Board of Health every case of small-pox, and to immediately provide thorough and safe vaccination for all persons who need the same, within the jurisdiction of said local Board; also isolate and keep in quarantine, and to regulate, prohibit or prevent communication or intercourse with persons, houses and places that have small-pox.

(3.) That the local Board of Health shall suitably provide places and means for the complete separation and sanitary care of infected persons and things.

Vaccination is a public duty for the protection of the whole community as well as of each individual and family; and it is so necessary to secure its protection in all places and for all classes of people that none have a right to neglect it for themselves, their families, the public schools or the community. The State Board of Health has directed its secretary to give whatever information or advice is needed

to secure the most perfect vaccine matter and the speediest and best application of it whenever and wherever it is required.

The State Board advises and requires that the law for vaccination of all who attend schools shall be faithfully observed ; and

That every local Board of Health be prepared against small-pox,—

By an agreement with all physicians to secure perfect vaccination in every household where they attend :

By instructions to health officers to ascertain who are un-vaccinated and exposed :

By notifying the State Board of Health at once, when and where small-pox appears, and by telegraphing or writing to this Board what their wants are ; and

By requiring prompt compliance with the local Board's orders, and by immediately instructing and aiding the community in regard to the same.

The State Board will co-operate with the local Boards of Health :—

By immediately answering and complying with requests from local authorities ;—

By telegraphing and writing to secure the best means of vaccinating ;

By sending to local authorities brief suggestions for immediate use in the community ;—

By supplying the few forms for records and reports which are required, together with the Board's printed cards of information relating to vaccination, disinfection, and the suppression or the contagion ; and

By guaranteeing the payment for limited requisitions, by the local Boards of Health, for fresh and pure vaccinal lymph from heifers, to meet any urgent necessity that cannot be provided for by the local authorities at the moment,—the said authorities then promising payment.

A Word of Suggestion and Warning to All.—Every infant should be vaccinated before it is six months old, unless a good physician advises to the contrary. Every person who has passed the age of twelve years should be re-vaccinated with fresh heifer virus, to test the fact of complete protection against small-pox ; and those who have had that disease should be vaccinated, as it may attack a person who was marked by it, as well as a person who has been only once vaccinated. Sufficient vaccination removes all liability to the disease. For this purpose re-vaccination is earnestly advised. Vaccination with lymph from clean and healthy inoculated heifers causes no disease. It can be obtained fresh every day from perfectly healthy calves, and within a day or two can be at hand for use in any town in this State, at a cost of from seven to twelve cents for each "slip" or "point." The Board of Health in each of the cities is earnestly requested to keep such a supply of vaccine at hand that it can instantly meet any exigency, or furnish a neighboring community with a few points of the lymph at cost. It should be inserted by physicians only, and they should examine the result at the end of seven days.

What to do when small-pox occurs :—

(1.) Place the sick in a separate room from which all clothing, carpets, upholstered stuff and the quilts and feather bedding have been removed. In such a room with open windows and an open fire, keep the sick and nurses entirely separated (quarantined) from all other per-

sons until the doctor and health officer takes charge. Then follow their requirements.

(2.) Let all persons who are near the sick be immediately vaccinated afresh, and let it be understood from the first that all bedding, clothing, towels and cloths which are touched or used by the sick shall be burned; and every place where the sick are, and where there is any thing that has come from or been exposed to them, shall be thoroughly disinfected as soon as possible.

(3.) A separate place, or even a hut constructed for the purpose, should be so prepared as to be safer for the sick than any ordinary dwelling rooms; that is, that the fresh air and sanitary care and nursing shall be the best possible; and that it shall be an apartment and locality from which the contagion will not be spread abroad.

(4.) That no delay or objection shall prevent the vaccination of all persons who have been in any manner exposed, or suspected of exposure, to the contagion. That if fresh vaccine is not at hand, the physician, or the health officer shall telegraph to the nearest person who can supply it. If the request is not immediately complied with, then telegraph the State Board of Health.

(5.) In case of death, wrap the corpse in a sheet saturated with the strongest disinfectant, and bury it in a deep grave within twenty-four hours, and without a public funeral.

(6.) Disinfect according to the rules given in the State Board's circular on disinfection (No. 16).

Special Recommendations.

The State Board of Health recommends that in whatever city, village or town small-pox appears, the entire neighborhood in which there has been any communication with the patient, or exposure to the contagion, shall be notified that the *State Board of Health requires that every person shall be protected by vaccination*; that whatever materials are infected shall be destroyed by fire or shall be kept in the zinc and salt solution, and be boiled without removal from the premises; that rooms and furniture suspected of contagion shall be fumigated with sulphur as directed by this Board's rules; that tramps and other persons suspected of infection with small-pox, shall be taken in charge by the police and the sanitary authorities; that employers shall advise their companies of employed persons to be vaccinated; and, in case of small-pox in their vicinity, to make such vaccinations one of the conditions of being continued in employment. This rule should be strictly enforced in all manufactories that make goods which are liable to become infected, and especially should be a standing regulation in public houses, and in all classes employed on railroad trains and passenger vessels.

Form of report to the State Board of Health and to the Local Board.

(Name)

..... is sick with small-
 (Name of house and place)
 pox (or varioloid) at..... The
 (Date)
 eruption began.....

It is believed the contagion was taken at....
by exposure to.....

No. of persons now exposed to patient.....

Who has the responsible care and custody of the case?.....

(Signed).....

(P. O. address).....

REQUEST:_____

Such a notice, with the request that needs to be made, should be sent to the health officer or the nearest member of the local Board of Health. If the physician is already in attendance, he should sign it; but if no physician has reached the patient, the householder and any other person that has charge of the case should sign this first report and request, and send it to the family physician or to the health officer. The physician who first sees the case, or the health officer, should write out such a brief report and his own request, and send it by mail to the secretary of the State Board of Health. If in a place where there is no local authority, health officer or physician, send the report, by first mail, to the secretary of the State Board of Health.

Subsequent Reports. The physicians and the Health Officer will please agree upon the report which shall be made to the State Board on its card (No. 31) for reporting the history of cases of small-pox.

Vaccination, Records and Reports. The form of records of inspection and vaccination prepared by the State Board of Health for the use of health authorities and physicians, is given on the leaflet marked [No. 39]. Every Health Officer is earnestly requested to make and preserve such a record, and to transmit a copy of it to the State Board. Physicians who vaccinate ten or more persons at any time during the year are likewise requested to make up and preserve this kind of record [No. 39], and to give the State Board of Health a copy. The blank form will be furnished and the postage supplied for such reports, on notice.

Vaccination, properly applied, is as effective now as it ever was but the medical and sanitary care to secure the perfect results which give protection are so vitally important, that the records of experience are to be henceforth preserved and studied to enable the people to obtain and voluntarily seek the benign protection which is needed against the loathsome contagion which threatens every person who is not well vaccinated. Prudent and timely action will prevent the attack of this blighting pest, as well as stamp it out. Panic and delay are worse in the presence of small-pox than in the midst of a raging conflagration in a city; and the vaccinator and sanitary inspector disarm the contagious destroyer as readily as the fire brigade—at a touch of the fire-keys—will suppress flames, before panic can occur. The timely action, controlling means, and suitable methods, prevent panic and loss in the presence of small-pox. For this reason, vaccination is a public duty, and Sanitary Law to provide for it and prevent contagion is a necessity.

Published by order of the Board,
ELISHA HARRIS,
Secretary.

REPORT OF STANDING COMMITTEE ON PUBLIC INSTITUTIONS.

INTRODUCTION.

In its report last year the Standing Committee on Public Institutions limited its statement to a few of the most essential questions relating to drainage, ventilation and the general sanitary protection which needed to be secured in the charitable and other public institutions of the State. In its report this year, the committee, by direction of the Board, has undertaken to present such an outline of results of personal inspection and exact inquiry into the present condition and sanitary wants of school-houses, as shall fitly serve the purposes of the Board to institute and induce needed sanitary improvements in our school-houses, and in the schools themselves, and, at the same time, to suggest and stimulate local concern in this matter.

At its meeting on 10th of August last, the Board directed the issuing of a circular for the purposes here mentioned. The obvious intention of the State Board of Health to institute a forward movement for the highest physical welfare of rising generations as they enter the public schools and pass onward, in the career of school children, and upward to the active responsible duties of mature age, incites in the mind of this committee a special interest which is, doubtless, shared by every member of the Board, and which must become widespread among parents, guardians and the great number of officers and teachers of the schools.

The extent of the Field, and the Public Interest in it.—Upwards of half the children are in the twenty-four cities; nearly one-half of the remaining number are in the 326 incorporated villages of the State. Many of these villages are not only remarkably populous in school children, but have evinced the most enlightened interest in the sanitary and other kinds of outfit of their school buildings. (Such instances, though they be rare exceptions, will be quoted in the report.) School children of all districts beyond the city and village limits have shared the common concern for the welfare of the schools, and the condition and wants of the school-rooms in which they are found are correctly set forth, to the extent these investigations have been carried, up to the time of making this report. The report now submitted must be regarded as simply preliminary to a continued and larger service, as now contemplated by the Board. The persons whose aid has been especially sought in this inquiry are, first, the trustees and other responsible officers of school districts, or the school board; the district commissioners; the State superintendent of public instruction, for such information and counsel

as he has generously given ; lastly, and chiefly, as regards the aid which has been invoked in this delicate and most interesting undertaking, Dr. David F. Lincoln, who, since the 1st of October, has given constant assistance in no less than ten counties and eight cities.

A copy of the circular as here annexed shows what has been sought as a basis of general information from school districts, and as this circular has only begun its mission, having been sent out gradually, week by week, we do not propose to tabulate or summarize the information thus far obtained by the circular alone, but shall depend rather upon certain exact kinds of information which have been added to this plan.

The Board having defined some leading objects to be kept in view, this committee has adhered to them, and thus far has limited its inquiries to the most practical sanitary questions ; and as these questions need no other discussion by us than that which they receive in the course of this report, we proceed at once to state what have been the results of the plan and progress in this duty.

In the personal inquiries pursued by Dr. Lincoln, as an expert engaged in this special branch of duty by the Board, and to some extent by the chairman of the committee, who has given all the time he could devote to this labor, a special book of memoranda for the annotation needed for uses of the Board has been kept in connection with each school so visited.

It is found that the circular has served a useful purpose in preparing a way for the visits. In selecting places to be visited those have been preferred from which, chiefly in response to the circular, active expressions of interest have been received, or requests for advice and aid, and those from which an invitation to visit has been received. In such cases a sanitary visitor from the Board goes prepared to find — and does find — intelligent information ready at hand upon points of general concern, and of statistical detail, to the great saving of his time. Those who receive him are often found desirous of information upon the theoretical basis of certain practical details in their systems ; or they have plans of a new school-house to make and inquire for a model plan, or for rules to follow, or they have a new school-house to show, and wish for criticism (or praise), and comparison with older houses ; or they desire some expression of support for their own views of hygienic reform.

The examination by visit has been restricted in its range by the practical impossibility of examining all points. This restriction has compelled the abandonment of all thought of extensive statistical inquiry ; such inquiry demanding a system of collaboration which there has been no time to organize. Instead, therefore, of formal tabulation, it has been the aim of the committee to present an account of the actual state of the school-houses in the places seen, each by itself, in the more essential particulars. The chief subjects for observation have been :—

1. Heating and ventilation, with especial reference to the appliances for the latter and the observed results in the condition of the air.

2. Lighting, with regard to the size and position of windows, shape of rooms and obstructions outside.

3. Size of rooms and over-crowding.

4. Desks and seats ; under which a few general principles will be stated.

5. Drainage, sewerage and plumbing, as far as accessible ; sanitary

conveniences, cellars, general care of house, nuisances in or about the house.

6. State of repair and safety.
7. Wardrobes, water supply and personal cleanliness.
8. School hours, recesses, gymnastics, singing.
9. Customs or rules observed in regard to the prevention of contagious diseases, and to vaccination.
10. Plans for school-houses have been criticised in another statement, herewith submitted by Dr. Lincoln, in which certain general principles bearing upon light and ventilation are given in detail. The reader is referred to that paper for various matters which do not so appropriately find a place in the present.

[No. 35.]

STATE BOARD OF HEALTH OF NEW YORK.

SCHOOL BUILDINGS, AND THE HYGIENE OF PUBLIC SCHOOLS.

The State Board of Health, having directed its committee on Public Institutions to issue a circular and make inquiries in regard to the condition and wants of public school buildings, invites attention to this subject throughout the State ; and with the design of obtaining useful information the following points of inquiry are respectfully submitted :

1. What is the number of pupils registered as attending the public schools to which this report relates? Mention these schools by name, or number, according as they are known by your School Board.
2. What is the total number of seats, or the seating capacity, in the study-rooms of each school-house here mentioned?

SUN LIGHTING.

3. State, under the name of each school-house, the dimensions of each of the study-rooms, and each of the recitation-rooms, which it contains (length, width, height).
4. On what side or sides of each room (north, south, etc.) are the windows?
5. Is the light in front of, at the right of, at the left of, or behind, the pupils, in each case?
6. Is the light abundant?
7. How near to the ceiling and to the floor do the windows extend?

VENTILATION.

8. How are the rooms ventilated? In how many of them are there open fireplaces?

9. In how many of them do the windows open both at top and bottom? or are provided with transom opening? or are specially arranged (and how) for ventilation?

10. Is there ventilation by shafts from the ceiling through the roof?
11. Are the openings for the escape of foul air sufficient and effectual? Mention the facts with care relating to this subject.
12. How is fresh air let in?
13. Is such supply abundant in the recitation-rooms? In the study-rooms?
14. Have you transoms over all or any of the doors?
15. Are the doors of the school-rooms hinged to swing outwardly or inwardly?
16. State what special safeguards there are against fire?
17. What is the estimated fresh-air supply for each scholar during school hours?
18. Are teachers required or requested by the school officers to clear and ventilate their school-rooms by opening windows and doors at stated hours of the day?

HEATING.

19. By what means are the school-rooms heated?
(Fire places? Stoves? Hot-air furnaces? Steam radiators in rooms? Hot-water pipes in rooms? Steam or hot-water radiators in the basement?)
20. If by stoves, are they so "jacketed," or surrounded, as to protect the pupils against excessive heat, and to secure a special current of fresh air from without to be heated and diffused by means of the jacket?
21. Is the degree of warmth regulated according to varying preferences, or according to the indications of the thermometer?

WATER.

22. What is the water-supply for use of pupils? whence is it obtained? If from a well, does the well receive a soakage of surrounding grounds?
23. Where is the water placed for use in the school building?
24. Is it pure?
25. Is it abundant?
26. What drinking cups are supplied?
27. What is the distance of the well or other source of the drinking water from the nearest privy, or latrine?

SITE AND STRUCTURE OF THE SCHOOL-ROOMS.

28. How high above the lowest valley in your district is the site of the school-rooms you have described?
29. Upon what kind of ground, as to its being dry, wet, gravelly, clay, swampy, or rocky, is the site?
30. If naturally swampy or saturated, are the grounds tile-drained and ditched?
31. In what direction does the ground of the site and its vicinity slope?
32. How high is the ground floor of the building above the common level upon which it is erected?
33. Is there a cellar? Is it or the sub-floor space damp?
34. Is there free circulation of the air under and about the school building?

35. Of what is the house built? Wood, brick, stone, or ?
36. When was it erected ?
37. Is there any plan for reconstruction, or for enlargement or any other improvement ?
38. Will its sanitary improvement receive the necessary attention in whatever changes are made ?
39. Are there groves within or about the school-house grounds?
Planted trees ? or shrubbery ?
40. Do the trees much overshadow the school-house ?
41. Please give in pencil outlines upon the accompanying schedule a rough ground plan of the first floor and also of each of the school-rooms, or of a sample of the rooms ?
42. Describe the kind of seats and desks in use.
43. State if they have backs. If they have foot-rests.
44. Height of seats from floor.
45. Height of lower edge of desk-lids.
46. Describe the play-grounds and state where they are.
47. Describe the water-closets and sinks, and state where located as respects the school-house, how they are cleansed, and if they are daily flushed with flowing water.

SCHOOL HOURS AND DAILY CARE OF PHYSICAL HEALTH OF PUPILS.

48. What are the hours of study and recitation in the schoolrooms ?
49. What are the hours or times for recreation during the school day ?
50. Are teachers requested or required carefully to regulate and improve the modes of recreation and exercise ?
51. Are the teachers required by the school officers to avoid those practices and errors of pupils that injure the eyesight ?
52. Are the teachers required by the school officers to avoid those practices and errors of pupils that impair bodily symmetry, the healthful uses of the lungs, limbs, and muscles ?
53. Are light gymnastics practiced ?
54. Where are outer garments and wet clothes hung ?
55. Are there means for drying them when wet ?

THE SEXES.

56. Are girls and boys taught in the same recitation-rooms ?
 57. Are they seated together in the same study-rooms ?
 58. Do they have the same hours, or length of time in school ?
 59. Have they separate play grounds ?
 60. Have they entirely separate and modest conveniences for the calls of nature ?
- [This point is of hygienic importance, and the mere asking of this question should insure the affirmative reply.]

PREVAILING COMPLAINTS AND SICKNESS.

61. Do the pupils frequently complain of headache ?
62. What percentage of the pupils are daily or usually absent on account of sickness ?
63. What established rules and precautions are there in the school against contagious diseases ?

64. Does the school register bear a record concerning the vaccination of each pupil?

65. Has the law concerning vaccination as published and brought to the attention of the school officers the present year been carried into effect?

66. What precautions would be enforced to-day were a case of scarlet fever, diphtheria, measles, or small-pox found among the pupils in the school-rooms?

67. What precautions and sanitary cleansing would be resorted to in the school-room after exposure to such sick pupil?

68. What precautions would be adopted by you concerning further intercourse between the school and families in which any one of these contagious diseases occurred?

[These questions are thus particularly asked because the very strict precautions should be adopted which are described in the State Board's Circulars Nos. 13, 14, 15, 16 and 17.]

Standing Committee { JAMES G. HUNT, *Chairman*,
on { J. SAVAGE DELAVAN,
Public Institutions, { EDWARD M. MOORE, *President*,
 { ELISHA HARRIS, *Secretary*.

ALBANY, Sept. 30th, 1881.

SYNOPSIS OF REPORT.

1. *Heating and Ventilation*.—The weather was very mild during the months of October, November and December, 1881, and over-heating was the more usual condition in the schools visited; defective heating was rarely complained of. Stoves are in frequent use, but indirect radiation from steam apparatus, and hot-air furnaces, are growing in favor. In a very few cases direct radiation was exclusively employed. A very few "ventilating" stoves were seen. Screens are systematically provided in some places, in others, not. Ventilation is very rarely if ever effected without the aid of windows. In most buildings the goodness of the air was proportionate to the freedom with which windows were opened. A very large proportion of school-rooms have exit flues of some sort for foul air, but few of the flues accomplish much, while many are transparent shams. A number of places have recently provided some of their old buildings with exit flues which draw well, but adequate ventilation by that method has very rarely been observed. Exclusive reliance on shafts with a careful closure of the windows has been found, whenever observed, to be accompanied by great closeness and over-heating.

These efforts at improvement have not however, been without their value. By way of comparing the old with the new, the "advance" school in Utica may be taken on the one hand, and schools No. 13 and 15 in Rochester on the other. The "advanced" is in a very large and compact house, with a seating capacity of over seven hundred; the scholars are just below the high-school age. The exit flues all discharge into the garret, where fifteen openings can be counted, besides those which are inaccessible on the east side. The size of almost all these openings is about eight by six inches. At a very liberal allowance (six feet per second velocity) each flue of this size exhausts

two feet per second. If each pupil requires one-half a cubic foot per second, then seven hundred pupils require three hundred and fifty cubic feet, which demands the services of one hundred and seventy-five flues of this size. Twelve, however, of the flues were actually found covered over with pieces of paste-board and brick-bats, placed there last winter to prevent waste of heat; the heating apparatus in the cellar not proving sufficient for the demand made upon it. And even if uncovered, the amount of air delivered would not probably have exceeded one third of what is assumed here, that is, one eighteenth of the amount required. It is customary in this school to keep the windows closed almost absolutely.

No. 13, Rochester, has in each room two inlets for hot-air (19" x 12"), and one exit for foul air near the floor, drawing well. The metal tube for each room is about two hundred square inches in section; with a velocity of six feet (too high an estimate), each tube draws a little over eight cubic feet per second, or a supply for sixteen pupils. School No. 15, has one common opening in the peak of the roof for all the flues, thirty-one by thirty-three inches in size. A velocity of six feet gives a discharge of forty-two feet per second; this is enough for eighty-four pupils, whereas the house contains about five hundred. No actual tests were made of the velocity, but the assumption is a liberal one.

The plan adopted in the case of indirect heating by steam is to place a coil close to nearly every window in the cellar in a wooden box which receives air through a pipe led to the window. The inlets are very often left undefended; they regularly contain some rubbish and dust, and are placed at the ground level, or within two or three feet of the ground. In exceptional cases the air from the cellar is used to supply the houses.

Fourteen rooms in six buildings were found supplied with efficient exit flues approaching sufficiency in delivery. The windows, however, were found open (sometimes widely) in all these rooms. In all houses where the windows were systematically shut the air was found oppressively close.

2. *Lighting*.—Excess of light is very rarely complained of; the contrary condition is common and in not a few schools is extreme. In old houses this is often due to the small size of windows; in some other cases windows are placed a great way from the ceiling, probably for so-called architectural effect; and in some the light has been almost entirely shut out by neighboring houses subsequently built.

Cases of poor lighting were found everywhere; numerous decided cases in most places; the worst, perhaps, in Troy.

The causes of near-sight are found abundantly. The inspection gave reason to believe that it is much more frequent than is generally supposed by those who have the charge of schools. The use of large charts for primary pupils instead of primers, and the frequent use of the black-board instead of book and slate, are to be recommended as diminishing the tendency to near-sight and weak sight.

3. *Overcrowding* exists to a lamentable extent in many places; the following examples are offered showing the number of cubic feet of space or square feet of floor allotted to each individual in certain rooms:

Troy, (floor space) from three and one-fourth to four square feet, six times; four to five, four times; five to six, six times: six to seven, twice;

eight, twice; eight and one-half, ten. Usual height of rooms twelve feet. Lowest cubic space observed, thirty-eight and one-half, forty-four.

West Troy, 45, 55, 83, 100, 119 (cubic space).

Utica, 51, 70, 72, 75, 85, 96, 125 (chiefly recitation-rooms).

Rome resembled Utica.

Yonkers, 57, 102 (in one house).

Bath, 5 floor feet.

Cohoes, not excessive; in one school eight rooms gave a floor-space of eleven and one-half, three times; twelve, twice; fifteen, sixteen, twenty-four.

Rochester, in seven cases (of buildings or single rooms) there were more pupils than seats. One room was noted with five and one-third square feet of space per head; but the houses were not generally over-filled.

Albany, 56, 60, 87, 90, 153.

Hoosick Falls, 77, 89.

Peekskill, 42.

New Rochelle, 80.

In stating that overcrowding exists, no high standard of space need be assumed with these figures before us. Any room where the space is less than one hundred cubic feet *per caput* is crowded even with little children; and it is desirable to fix the minimum much higher.

4. *Desks and seats* should be so placed that the pupil is induced to sit erect while at work and is properly supported in doing so. The chief faults (some of them almost universal) are the following: too great height of desk; too great height of seat, or want of foot rest for young children; insufficient size of seats; distance of desk from seat (the former should overlap the latter); rigid outline of seat, causing fatigue and pain; incorrect curves to the back. There are considerable variations in this respect in recent patterns, and most of them are more or less ill-adapted to give proper support in sitting upright.

5. Conspicuous *want of cleanliness* and a ruinous state of the privy accommodations are characteristic of certain places. It hardly needs to be said that this is a point at which reform ought to begin at once. It is urgently needed. Foul habits are being taught in many schools, and injury to health from the frequent proximity of vaults is something to which most of the towns visited are exposed. The principles of correct plumbing are scarcely applied consistently in any place. The instances are almost as rare as those of correct and full ventilation. A high standard of sanitary practice is desired, however, in some places, and would ere long doubtless be welcome in all, if placed clearly in sight. There is fully as much uncertainty or ignorance in regard to correct principles as there is willful neglect.

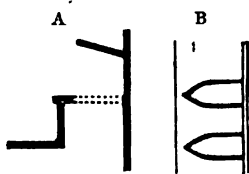


Fig. 1. Privy-seats from an institution of learning; A seen in section B seen above.

The accompanying diagram will illustrate the extent to which want of common sense in simple matters may go. In far too many cases, reliance is placed on the mechanical device there depicted (with what results, the experienced know) — instead of *first* making the accommodations light, neat, modest, and ample, and *then* exercising a reasonable oversight.

6. In a very few places the houses were found in a neglected state and out of repair. Positive danger from the occurrence of alarms of fire is best prevented by good discipline: as regards the mechanical precautions for ensuring a speedy and safe exit to a crowd in a state of panic (for such an event is possible in a well-governed school), something yet remains to be done. The obvious precaution, of causing the doors to open outwardly, of making the stairs wide, strong, easy and safe at the well side have not been sufficiently attended to in a considerable number of cases quite widely spread as to locality. Positively bad and dangerous staircases have been observed in a few instances.

7. The matter of personal cleanliness is attended to in some places. At Lansingburgh wash stands with soap and towels are provided, but in most places there is no opportunity to give "object lessons" in this branch. In many schools in cities there is no place to wash. Wardrobes are provided in the newer but are wanting in many of the older schools.

The schools in many cities use aqueduct water for the most part. (Rochester, Utica, Schenectady, Albany, Yonkers, Peekskill, Troy, Cohoes.) Outlying districts however often have to depend upon wells; occasionally they borrow water from neighbor's wells, and in a good many cases there is reason to suspect upon general grounds that the water is contaminated.

8. The usual *hours of attendance* at school are from nine to twelve A. M. and one and a half to four P. M. with a recess of fifteen minutes in each session. In some places a brief intermission at the end of each hour is directed, with gymnastics and marching, but there is a general tendency to omit this part of the programme. The practice of gymnastics is entirely neglected in the higher grades, where it is greatly needed, especially by girls. The singing, marching and gymnastics were especially good in Utica.

In Albany, Troy, Schenectady and some other places the schools have recently adopted the plan of dispensing with recesses and shortening the hours of attendance by half an hour in each session. Further experience must determine the value of the change.

9. *Vaccination* is compulsory in Troy, Yonkers, Rome, Utica, [Peekskill, New Rochelle, Schaghticoke, Hoosick Falls, West Troy, Green Island?]

Recent strict enforcement, with relaxation at the present time in Albany, Bath, Cohoes, Waterford, not compulsory in Rochester, Schenectady, Lansingburgh, Brockport, Spencerport, Fairport, Clarkson, Hamlin, Sweden, Ogden.

Contagious diseases are left to the judgment of the teachers, which in some cases is backed by a rule of the school board. The practice of excluding from school all children from the family where a case exists is uniform, but the exclusion of all coming from the same house or tenement is a point not defined by the regulations of school boards. Information in regard to new cases is not systematically obtained.¹

Rochester affords a fair example of the general practice and the want of uniformity. From this city a number of replies given to the ques-

tion (No. 63, circular No. 35), yield the general statement that in the case of contagious disease occurring in a family all members of the family are excluded. One adds "not admitted while it is supposed there may be any danger of contagion;" some say "excluded until a physician's certificate of safety is brought;" and one principal says: "Pupils are asked to report cases of contagious disease in the district, and pupils from such families are excluded until all danger is passed. If a pupil is absent, the teacher ascertains as soon as possible why he is absent;" and another principal writes: "Frequently, however, families conceal the presence of contagious disease, and continue sending children to school."

The record in the case of Syracuse is also striking. Careful returns were made from each of the schools, sixteen in number, by the respective principal. Vaccination is required in all; a certificate is to be shown, which in some cases is preserved; a record of the fact is made on the school register by seven principals, while no record is kept by eight. The existence of the State law of 1860 [empowering school authorities to enforce vaccination], is unknown to several. As regards the precautions to be observed in cases of contagious disease, there is a considerable, and really an important difference in the answers returned. One principal in Syracuse writes: "The child affected, together with others (if there were such) occupying the same building or living in the immediate vicinity of the child, would be sent home and forbidden to return until all danger of contagion has passed." Contrasted with this very strong reply is another: "The infected pupil would be sent home"—and nothing more. As regards sanitary cleansing of the room after exposure to a sick pupil, one says: "Nothing would be done;" another, "Nothing, unless next day happened to be cleaning day;" another, "I do not know;" while several state that fumigations and cleansing would be employed. As regards intercourse with the family, strict quarantine would be maintained by some, while others would appeal to the superintendent, or the Board of Health, or do nothing.

Yonkers has an ordinance passed in 1877, requiring every practicing physician, under penalty of fine, to report to the Board of Health the cases of contagious disease occurring in his practice. Much opposition was made to the passage of the law. The reported cases, however, are not brought directly to the notice of the school authorities as they should be. Cases of such disease, and all children residing on the same floor or in the same family, are alike excluded from school until a certificate of fitness to return to school is given by the physician. The fact of vaccination is recorded on the school register. It is greatly to be desired that the same provisions should be adopted in other places wherever a local Board of Health exists.

The following outlines of sanitary rules are recommended to the State Board of Health for adoption by local school authorities. They are presented in a form suited for direct transfer to the public school regulations, with the exception of the bracketed portions [], which may depend on local circumstances for their application or feasibility.

Proposed Sanitary Rules.

"1. Every person entering the public schools of must give satisfactory evidence of protection against small-pox, or be excluded from the schools, until the rule is complied with as provided by the Statute of 1860." [See synopsis of the statute as appended, pages 120-122.]

"2. The fact of vaccination and protection should be entered with each name on the school record [and on transfer or promotion lists so as to avoid further inconvenience to the pupil].

"3. Persons affected with diphtheria, measles, scarlet fever or small-pox shall be excluded from school until the school officer's permission is presented stating that it is safe to receive into the school the person so recently affected.

"4. Intercourse between the school, and the family or house where there is a case of any one of these contagions, must be forbidden until the official permission named is given.

5. It will be the duty of every teacher and school officer who discovers a case of any one of these contagious diseases to cause the fact to be immediately reported to the local Board of Health and to the proper trustee or school board. [The Board of Health should assume the duties of quarantining, disinfecting, as well as of permitting the pupils' return, etc.]

6. If a child is ascertained to have attended school while affected with any of these contagions, the local Board of Health shall be requested to direct the proper disinfection of the school premises. In the absence or delay of such sanitary authority, the physician in attendance, with one of the school officers should direct this duty in accordance with the rules for disinfecting and cleansing, given in the State Board circular, No. 16.

7. Rule 3 must invariably include all persons from the family where the case of sickness exists. [It should extend also to all persons living in the same house, at the discretion of the local Board of Health.]

8. [If there is no local Board of Health, the school authorities, with medical advice, if possible, should decide the question in brackets under rule 7 and should take the advice and assume the duties mentioned in rules 5 and 6.]

9. [It is desirable that all cases known to the Board of Health should be at once reported to the school authorities; and the latter should request that Board to do so, and every teacher and school officer should promptly inform the health authorities of every known or suspected case of contagious diseases.] In such instances the duties of all these officers and persons are reciprocal, and none can prudently be neglected.

The statute (chap. 438, laws of 1860) makes the following provisions:

1. The trustees of school districts, and the school boards, are empowered to exclude from the public schools all unvaccinated persons until they are vaccinated.

2. This power may be exercised by trustees or boards after passing a resolution to that effect, and posting a notice for at least ten days in two or more conspicuous places, within the limits of their respective board or district organizations. Such notice should offer free vaccination to those unable to pay. [The form necessary in such cases is given in the circular (No. 17) of the State Board of Health. This circular with No. 41, has been sent to every school district clerk in the State.]

3. The trustees or board are further empowered to employ and pay a physician who shall make a list of all persons within the school age that have not been vaccinated, and shall vaccinate and provide with certificates of vaccination those persons whom the said trustees or board directs. [The local Board of Health is required, under chapter 421 of

1881, to supply all necessary means for gratuitous vaccination, make all needful provisions for immediately obtaining the necessary means for thorough and safe vaccination of all persons within the said jurisdiction who may need the same.]

4. The amount expended is to be included in the annual tax bill. [The new law enables the town, village or city to meet the expense by its local Board of Health.]

5. The trustees of school-districts are required to include in their annual report the number in their several districts between the ages of five and twenty-one who are vaccinated, and the number not vaccinated. [Any local Board of Health can require compliance with this law.]

Upon the whole, no subject within the range of the present report is of greater importance than that of the provision for the lower bodily necessities of scholars. There is no point in which there is such an opportunity for reform at a moderate expense, and in which the direct results will be so immediate, and the remote results so wide-reaching.

A correspondent, the teacher of a county school of only nine pupils, writes as follows :

"The boys and girls use the same out-building. This should be looked to more by the school-trustees of our district-schools in this State. The chastity of the boys and girls is assaulted day by day in our district-schools by this neglect or oversight by school boards in this State generally."

Is this charge sustained?—The facts are these:—In the circular (No. 35) which the Board has sent out to 6000 districts in this State, the question occurs (No. 60): "Have the girls and boys entirely separate and modest conveniences for the calls of nature?" The replies from country schools have not been tabulated as yet; but, by way of sample, 100 replies to this question were taken at random from the mass. Of these sixty-six (66) were in the affirmative and thirty-four (34) in the negative. That this proportion is a tolerably fair statement of the whole, we think may be assumed; for confirmation we refer to the report from district-schools, herewith published. Specifically, this means that the out-houses in about one-third of the cases are not separated; sometimes there is but one; sometimes a board partition is put in—which is usually cut through in several places; generally there is a communication of sound from one to the other side; the children see one another in passing to and fro. And of the shocking sights within, few readers of this report can be ignorant. Now, there is a fearful neglect of a disagreeable duty evident here. Trustees and boards are to blame for not providing decent accommodations. Teachers are to blame for not controlling the behavior of children. Neither can act, without the co-operation of the other; and, withal, of the scholars, too—for the interest, pride, self-respect of the boys *must* form an item in any scheme for improvement. What can be done when a lady teacher resolves, from the first day, never to approach or look upon the spot in question? What, when a new school is planned in such a way as to compel boys and girls to occupy closets within the plainest hearing of one another. (see figure).* What can a pure minded young girl do but abstain from using a place where she is exposed to the almost immediate personal contact of any boy who happens to have a love of vile mischief? Some will become blunted; some will become polluted; some will stay away, and encounter the dangers of retention of the natural discharges.

* See Diagram of Automatic Closet, Utica, p. 156.

RESULT OF INSPECTION OF PUBLIC SCHOOLS.

CITY OF ROCHESTER.

The city of Rochester has twenty-six public school buildings, all of brick but two. Four are of one story, seventeen of two, four of three, one of four.

In eight instances the lot is hemmed in by houses or darkened by trees. One new house, on a very large lot, stands within ten feet of the boundary line; no present inconvenience results; but precisely this arrangement in other cities has rendered the school-house worthless as population has grown dense around them.

There is often a deficiency of play-grounds, which is usually made up for by the neighborhood of parks or thinly settled streets. But this compensation is not always found. The Free Academy stands in the center of the business part of the city; the house is distant ten feet on the one side from a church, and twenty feet on the other from a lofty warehouse. The resulting deprivation of light does not affect the scholars directly, but it has compelled the adoption of a plan by which the first story is given up to the officers of the school board, and the pupils are obliged to ascend long flights of particularly steep stairs, twenty-six steps to a flight. The result of this isolation is, that the girls remain without a change of air to out-doors, from eight and one-half to one o'clock, while the boys congregate on the sidewalk in front of the house. The girls have to climb two of these flights to reach their rooms, and the boys but one.

In some of the older houses there are steep winding stairs which are dangerous. The principal of one remarked that but one accident had happened in his school; he had himself fallen down the stairs within a few weeks of his entrance upon his duties, and from that time forth had seen to it that the children always went slowly and in single file upon the stairs. Several of the staircases have no break or landing, as is the case in the handsome new house number fifteen.

As regards safety in cases of fire, the reply given by those masters who were questioned was, that they could insure that every scholar would be placed in safety outside of the house in two minutes from the tap of the bell. A deficiency in the means of egress was not noted. The original plan of number twelve was so faulty as to require the addition of fire-escapes (stairs) from the second story. In two cases the floors are fire-proofed or deadened by a layer of plaster or mortar spread between the joists. The corridors are small and dark in some cases, and the street doors in almost all cases open inwards.

Overcrowding is not a characteristic of the Rochester schools at the present time. It was noticed in a few cases, *e. g.* —

No: 4; one room, 48 seats, 61 children.

" " ; another room has only $5\frac{1}{2}$ square feet of floor-space per head.

" 17; 2 rooms, 46 seats, 67 children, and

" 18; 2 rooms, 79 " 52 " ,

" 18; 2 rooms, 79 " 86 " ,

" 18; 2 rooms, 79 " 91 " ,

39x24 and 23x26, giving 11 and $6\frac{1}{2}$ square feet respectively of floor-space per head.

No. 26; entire house, 332 seats, 330 children, inclusive of 30 seats placed in the corridor. The corridor runs the whole length of one side, and it is proposed to fence off the middle third for these children. This plan cannot be approved, except in emergencies, but it is found elsewhere — as in No. 24. As a rule, the rooms for the highest grammar classes are thinly filled.

Defective lighting is frequent, and in many cases is due to antiquated plans. Glass partitions are common. Too great compactness of plan is characteristic of the old buildings; it is associated with defective natural ventilation. Fourteen schools may be mentioned as badly lighted. In several, however, an evident care had been given to placing the black-boards correctly, in relation to the light. Special study of defective vision was not made. Five children were found (in one room containing fifteen or twenty of about the age of eleven), who were seated in a special place near the black-board on account of near-sightedness. Their ages might have been near twelve years. The room was very badly lighted, over-heated, and very close — and the children were just commencing a new year in it.

No very radical novelties in school architecture can be mentioned in Rochester. School No. 6, which was built on a very bad plan, has just been remodeled in a very satisfactory way, yet with great simplicity in arrangement. The best and newest, No. 15, is on the simple square plan with wide corridors, a single, straight, unbroken stair to each story, plenty of cloak-rooms, an abundant quantity of light, and sufficient space.

The plans in general use give each class and teacher one room of its own. For purpose of general exercises in common, glass sliding partitions are in rather frequent use, converting a whole floor temporarily into one room. The Academy forms an exception, having one very large room for study on each floor with smaller rooms for recitation.

Heating and Ventilation.—Eighteen buildings are heated by stoves, one by hot-air furnaces, four by indirect radiation (steam), one by direct and indirect method combined, and one by stoves and furnace, one by furnace and open fires if needed. Four were said to be poorly heated. Double windows may be recommended in some exposed sites.

The stove flue is made to warm a contiguous flue, or an air-space surrounding it, for purposes of ventilation, in all the cases except five. In two of these, the windows are provided with boards to deflect the air upwards, and in three, there is no special arrangement whatever for ventilation. In no case was the "system" relied on entirely. The opening of doors, transoms and windows is universal, and was understood to be the practice in most days in winter. It was evident to the senses that this was indispensable, even when there were good systems in full operation. In most rooms of most of the schools there was decidedly poor air; a fault not always to be charged to the teacher. A good deal of effort has lately been made to increase the ventilation by adding flues, properly placed, constructed, and heated, but in no case does the amount of air removed approach the requirements of a good standard. This has been ascertained in the case of seven schools by measurement of the air currents with the anemometer, as stated in the Health Officer's Report for 1877 and 1878. In one other case there was

stated to be good ventilation; but the evidence of the senses was to the contrary.

Undue heat was rather common at the time of the visits. In School No. 5 a low temperature was observed; the scholars were comfortable (and the air was sensibly good) at a temperature of 60° — 65° F. No unusual facilities for ventilation exist in that house. The temperature prescribed by the school regulations was from 68° — 72° F.

Special Cases of Ventilation. (No. 5.)—Open fire-places without fires. Openings of about two-thirds of a foot into the flues near ceiling. Weather mild; currents in flues active, house freely aired by windows; air good and cool. (No. 7.)—Window-boards, and free opening of windows; house cool (with one or two exceptions), and where cool, air is pure. No exhaust-shafts. (No. 10.)—Was considered to be thoroughly ventilated, according to theoretical requirements and the tests applied by a commission some years ago. When visited, seemed decidedly close. Free passage of air is not aided by the plan of the house. There are two ventilating-shafts, each of twenty-six feet section, minus the space occupied by a twenty-four inch iron flue in one, and by a tile flue in the other. These shafts draw from the floors of rooms by means of horizontal ducts; they have the defect of acting upon all the stories in common. (No. 13.)—See remarks under General Summary of Results. (No. 15.)—The same. (No. 1, Academy.)—Two brick shafts, each containing as a core a brick smoke-flue. Total sectional area about twenty-five square feet, cut up into eight parts. As regards the rooms, the foul-air registers are altogether too few and small; and the great size of certain rooms adds special difficulties. The use of open windows is indispensable, yet far from sufficing for certain rooms. Air stagnant in many places. (No. 9.)—Has just been remodeled. One flue, 12x8 inches in a division wall, starting from the cellar with a free opening into the latter, passes three successive stories of rooms, and is expected to draw from each one satisfactorily and adequately; there is one such flue for each room as counted at the ground floor. (No. 14.)—Illustration of the necessity of providing separate flues. A match being lighted at the register for exit of foul air in the second story, the smell was directly perceived in an abundant current of air which was drawing *out of* the shaft into the room above, in the third story. A similar transfer of air from cellar to first story was noticed in No. 5; the latter case was one likely to escape observation, as the opening through which the air entered was an unused fire-place. (No. 8.)—An exhaust flue between two rooms was used by both. The registers are opposite, so that one can look through. Air passes from one to the other room at times. (No. 12.)—Ventilation greatly complained of. From 10 to 12 per cent of the scholars are said to be absent during some of the winter months, owing chiefly to colds contracted in school.

Over-heating was specially noted in nine houses.

The cellars are not deserving of much praise. It was very rare to find a cellar with a good pavement of cement and a positively neat look. A few are quite dark, generally because the windows have been occupied by the boxes for cold-air supply to the furnaces. A good many have an earth floor; a few are damp or are wet in spring; (2, 8, 9, 12, 23, 25), one seemed particularly cellar-like in smell. (14.) Dampness of the house as a cause of illness, was complained of in Nos. 8, 22, 23. The

site of No. 22 is low, with a clay soil. There is no cellar, only a hollow beneath the house into which water naturally drains. Consequently, in rainy seasons, besides being surrounded by a slough, the floors and atmosphere are rendered damp and unwholesome. The pupils suffer frequently from colds and sore throat.

House drainage. As a general rule, the facts in relation to the sewers are not attainable by a visit to a school. The existence of traps upon a main drain is generally negatived; even the set-basins and troughs (of which there is a good supply) are often without proper trapping. There was not found in any case an indication of that item which is now believed essential to the safety of a trap, viz.: a tube for ventilating it. The material of which the drain is composed varies, and the pipes are in all cases buried under the cellar floor.

In some cases there is a direct communication between the sewer and the street, and set basins in the house.

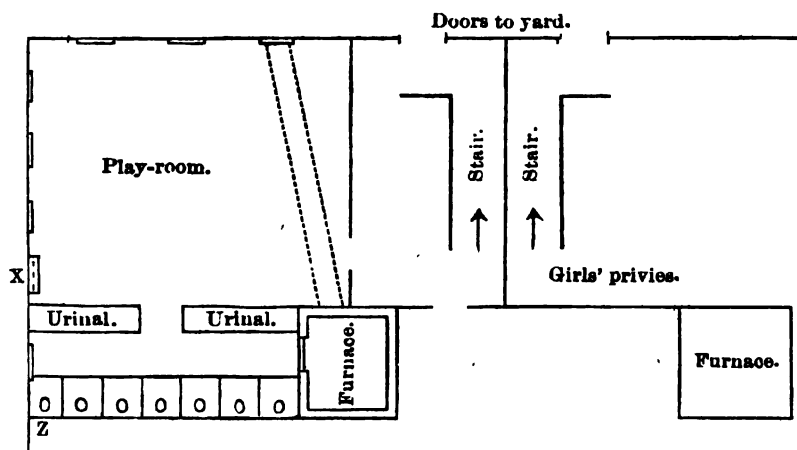
There are ten schools provided with water-closets of the hopper patent, in the cellar with urinals. This class of closets is quite unobjectional, if properly made, and is very cheap. But the kind here used is unprovided with means for giving a sudden and abundant dash of water; the stream flows like that from an ordinary (large) faucet, and fails to carry before it *en masse* the contents lodged in the trap; a piece of paper may be seen lingering there an indefinite length of time while the current flows. Janitors are instructed to poke out the traps every day with a stub broom. They also use disinfectants, mostly copperas. It is surprising that no more offensive odors arise from these apparatus. The arrangement for letting on water is automatic, and is often found inoperative. This is a dangerous fault for obvious reasons.

House drainage of detailed cases.—No. 1. (Free Academy) This building has five water-closets for girls in the third floor; they are in the rear corridor, properly screened, and detached from the school-rooms. They were found in good condition as regards neatness, but one did not retain its water, and one ran continually.* In the cellar at one place are four hopper closets and two porcelain urinals, all automatic. The iron water-closets are lined with enamel which is worn off. There are five disused closets in another part of the cellar. Both places were poorly lighted, and have no ventilation; they had a stale smell, about as disagreeable as any I encountered in the city.

No. 5. The house was built in 1876. The privy for boys is in a cellar room, freely communicating with a play-room, and the latter likewise

* "Whirlpool" pattern.

with a stair leading into the main corridor of the house. The door of the furnace opening into the hot-air box is in the water-closet room.



Across the play-room is led a box flue for fresh air to supply the furnace, which has a valve intended to open into the play-room and receive its air. There is a chimney in a corner of the play-room (x) heated by the furnace flue; air from the cellar passes very rapidly up the other chimney, and by one flue escapes into the school-room above. At z is a ventilator drawing strongly from the water-closet room. The water-closet is a metal trough emptied twice a day, with water constantly running in, and with no offense to the smell when tested quite closely.

No. 6. This is an old building but has this summer undergone a remodeling with the intention of securing complete and thorough sanitary protection. The attendance averages seven hundred. The water-closets are the usual hoppers; at present very little odor.

They are properly separated from the cellar (see figures). The sewer (of tile) runs under the earthen floor of the cellar; into it discharge (1) the contents from the roof; (2) the set basins; (3) the water-closets. The janitor does not know of any trap in the sewer; and there is one set-basin in the east end which has no trap.

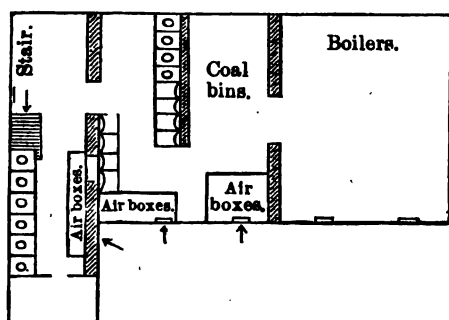
When this house was visited, complaint was made of the smell of cellar air in certain rooms. It was found that air was entering from certain registers where it ought to pass out; and as regards the odor it was traced to some new paint (?) in the cellar, very close to a place where a gap of a foot or two had been left in the top of an air duct, *out of sight*.

No. 8.—Rebuilt in 1880. It has privies at a good distance, neatly kept. Under the foundation is to be seen an open canal containing standing water, which is supposed to be a sewer. The basin in the entry is untrapped and leaks. The cellar was very wet last winter; an un-stopped flue affords a free channel for the passage of air from the cellar to the school-room.

No. 10 has recently received the addition of water-closets in the cellar. The arrangement is a most undesirable one. Odors have easy

means of egress by the stair into the corridor, and through cracks in the air boxes into the school-room. The closets were not offensive at nine in the morning, having been washed out since the last session; but after a few of the boys had been down, by ten and a quarter they became decidedly offensive. They make a hideous rattling noise while the water is running. The urinals throw a jet of spray forward in a threatening way, compelling the boys to stand back; the floor is therefore used instead. They are all at the same height from the floor (21') so that it is impossible for small boys to use them. A ventilating aperture in the boys' department draws, but does not much relieve the nuisance. In the girls' side a bell trap in the cemented floor gives exit to the water used in washing down; it allows gases to return from sewer.

Diagram of part of cellar, School No. 10, Rochester, showing proximity of air supply to 10 water closets and 8 urinals.



No. 12 has a cellar divided longitudinally by a wall into two parts, with access from corridors, one for each sex. At the far end of each part are water-closets with no special ventilation, not well lighted, and not very sweet.

No. 13 has nine water-closets for boys in cellar, in a room with heavy walls, entered from outside by a porch and steps; a door shuts it out from the cellar. It is rather dark. The bell-trap in the floor gives a current of air both ways. The girls' water-closet is isolated similarly, except that it is entered by a stair from the corridor. It has one window which is nailed open.

No. 19 has in the cellar eight disused water-closets not disconnected; the privy in yard is used instead. A pipe from one of the urinals in cellar is burst.

No. 20 has in the cellar a disused water tank, the overflow pipe from which has a strong inward draught—perhaps from some sewer; it runs through the wall of the house.

Privies.—Sixteen schools in Rochester depend on the use of privies. These are not at all in a uniform state. No. 15 has one brick house for each sex, widely separated, with a board fence in addition between, and over a hundred feet from the house; they are in good condition and have only such odor as is inseparable from the use of a vault in that manner. The only serious objection that occurred to me in inspecting it was the exposure to the weather. This is a fault common to all; it is of course objectionable to bring the building near the school-house

in order to shorten the walk. None of these structures has apparatus for warming. Nine are from ten to fifty feet distant from the school; four are a hundred feet or more distant. Six were offensive, sometimes in a very marked degree, to the inmates of the school-rooms or to the eye of the visitor, and one wanted a urinal.

The drinking water is furnished to most of the schools by the aqueduct from Hemlock lake; one of the purest sources in existence. It is, however, sometimes contaminated by the admission of water from the Genesee river, containing large amounts of impurity. In the Academy the drinking water is drawn from a leaden tank; the instructor in chemistry has repeatedly found distinct traces of lead in that water. Schools twenty-one, twenty-two, twenty-three, drink water from neighbor's wells, situated rather close to privies—within twenty or thirty feet. No. twenty-four has a pump in the cellar, over one hundred feet from a privy but on a lower level. No. twenty-five uses filtered rain water.

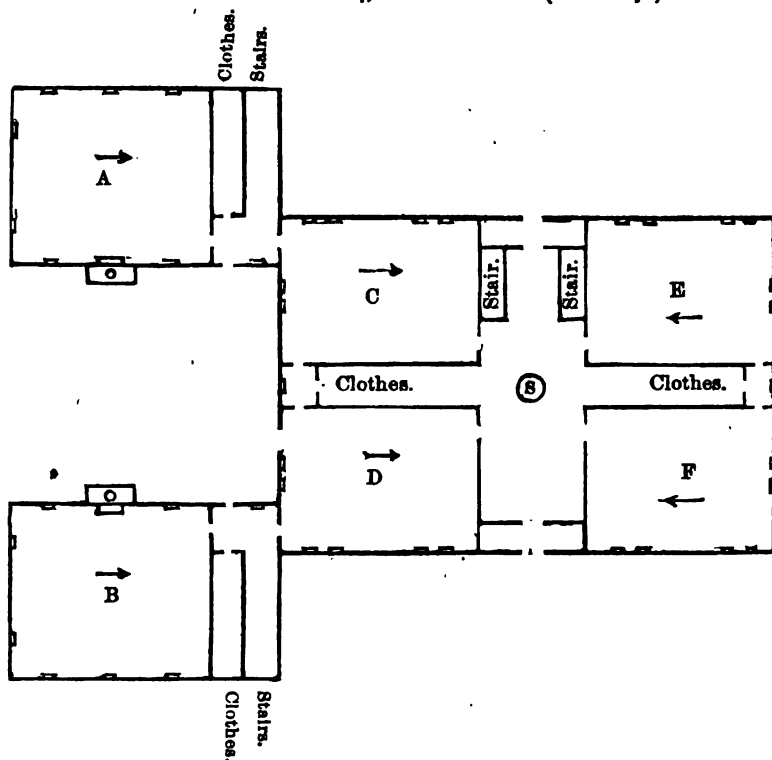
School No. 4. (Special detailed report.) The account of this house is given in detail as it is one of the best in the city. It was built in 1874 and received the addition of two wings in 1879, so that it is old enough to have had oversights in plan corrected and new enough to represent recent views of architecture. The principal, Mr. S. C. Pearce, is a man of intelligence and energy, greatly interested in the health arrangements. The building was visited October 10th and 24th, the first day rainy with strong westerly wind; the second day cool and damp with little wind.

The building is of brick, **three stories in height*, facing eastward, with a good, well-aired cellar, and a spacious attic sometimes used as a play-room.

The play ground for each sex separately is about 13,000 square feet covered with coal ashes. The front portion is not divided. The rear is cut in two by a board fence running from the house back. No buildings or trees impede the access of air and sunlight. The neighborhood is respectable but not wealthy.

*NOTE.—Objectionable points are italicized.

SCHOOL-HOUSE NO. 4, ROCHESTER. (1st story.)



The portion A B, is new, C D E F is old. The new rooms in each story measure 31' by 22' 5". The old rooms measure twenty-two and one-half feet in breadth, and from 29½'-32' in height. These proportions are good. The first story is 13'9½" in height. The second is 10' 10" the third is 17' 2". The upper stories resemble the lower in plan.

The windows in room C are six in number, eight feet high, twenty-eight inches across the glass exclusive of sash. This gives 112 square feet of glass, which is a little over one-sixth of the floor-space. There are about two feet of space between the glass and the ceiling. Transoms are placed over the room doors.

Taking the entire house, the floor-space of the class-rooms equals about 12,700 square feet. This divided among 718, the number of seats, allows 17.7 square feet on an average to each desk and seat. Somewhat more space is desirable.

There is an average attendance of about 750. Some rooms are over-filled. Room C had 48 *seats* and 61 *pupils*, which gives about 150 cubic feet of space per head. For three weeks, before a better distribution was made, there were in this room seventy pupils, very young scholars. Another room presents an example of really reprehensible crowding. It registers thirty-five pupils of the youngest grade. Its dimensions are only seventeen feet six inches by ten feet, ten inches, and thirteen and three-

quarter feet in height, giving a *cubic capacity of about seventy cubic feet per head*. This room is situated at the south end of the second story corridor, which should have been left free. *It has no means of ventilation except by opening the transom at one end and the window at the other*, which gives an insupportable draught.

The rooms are heated by a stove in each, properly guarded by a sheet-iron screen. Each of the old rooms has a ventilating aperture of moderate size at the floor and one over it at the ceiling, the draught in which was found irregular and weak, since *one and the same flue* of the size of eighteen and a half by ten and a half inches *is expected to do the work for three rooms, one over the other*. In many of the rooms the *apertures were closed*. The flues extend to the cellar. The cellar opening to one of them was found uncapped, the cover having rusted away (?).

The new rooms ventilate by a register (eighteen and one-half by eleven and one-half inches) at the floor level, to a brick shaft two feet four inches by three feet eight inches, inside, which contains a ten-inch cast iron flue into which the stoves of the room discharge smoke. The draught was good. In all of the rooms, however, *there is wanting a provision for introducing the air* as well as taking it out; but the stoves are soon to be superseded by heaters in the cellar. The air of the house varies but is usually not perfectly fresh. Windows are often open and in fact are almost entirely relied upon.

A part of the upper *corridor is walled off* and entered by flap doors. This space is used as a recitation room. It is *dark and close* and smelt of gas from a stove.

The clothes rooms are wide open to the corridors, but the windows at the farther end were shut. They were quite *close*.

The room for the seventh grade had *seats* suitable for the sixth (seats fourteen and a half inches high) so that twenty-three of the scholars actually using them did not rest their feet upon the floor when they let them hang down.

Some experiments made in 1877 in ten of the rooms of the older building resulted in statements which may be summed up as follows: A supply of 750,000 cubic feet of air per hour being required, the actual exhaust of air was 107,000 cubic feet. (Report of the Health Officer of city of Rochester, 1878.)

On each floor there are three three-quarter inch hose bibs and 100 feet of hose within easy access. The hose is school property. There are four points of egress, *the doors opening inwards*. The floors are laid in two inches of mortar except the lower floor of the north wing.

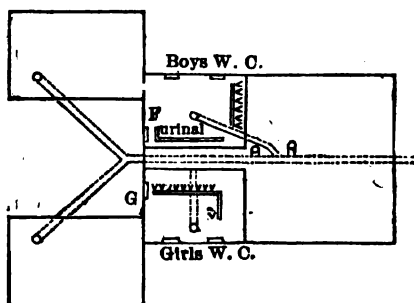
The corridors are spacious. The staircase in the old building is in two parts, meeting half-way at a landing and reversing its direction. It is sufficient and not very steep. With the free communication that exists between the rooms, escape in case of fire is sufficiently provided for.

There seems to be enough light in the rooms. C, for example, although the rear light is rather poor, is well lighted from the sides. As is universally the practice in this city, the children *sit facing in, a direction determined only by convenience of administration*, and hence often receive the light in directions not quite desirable. The arrows on the plan indicate the way the children face. *Black-boards* are placed without reference to the position of windows.

The result of a similar testing of the new rooms would doubtless be more favorable.

The drainage and sewerage is illustrated in the annexed plan of the cellar. The circles represent openings in the floor. The water-closets are entered from the wings, and there is no door at that end of the water-closet rooms. The door at the eastern end of the room is closed to maintain the separation of the sexes.

SCHOOL-HOUSE NO. 4, ROCHESTER. (Cellar.)



The openings in the cellar floor are secured by *bell traps*. These are further secured by running traps in the wings. That in the north wing was found to emit a current of air having *a very decided sewer smell*. Those in the girls' and boys' closets are kept filled by the daily swabbing of their cemented floors. Those in the center of the main cellar receive the discharge from the six drinking places of the old building and one private urinal up stairs; disconnection is made, the water dropping in sight from a lead pipe upon the bell trap in the floor. These wash places are trapped but the urinal is not.

There is thus in the cellar a long tract of drain bearing matter from the water-closets in which a current of air *may at any time* (especially in cold weather) *set back and force some of the traps*. The simple upward suction of the house air tends to do the same.

The drain under the boys' water-closet is flushed by the rain water from the roof led in at the end next the cellar wall. The urinal receives at its upper end the waste water from three drinking faucets in the north wing, the troughs to which are tapped. The girls' water-closets are also flushed by the waste water from three faucets in the south wing, but in this case *the sewer is connected directly with the waste pipe (at g), and only one of the three faucets is trapped*.

The water-closets are hoppers acting automatically with an S trap, which *constantly gets full of foecal discharges*, and has to be poked out with a short broom.

The urinal is a trough of galvanized iron, with a perforated pipe at its border which discharges small streams of water.

Very little offensive odor was noticed. The two rooms in the cellar are unusually well lighted. Each, however, *communicates pretty directly with a space between two school-rooms*.

There is a wooden floor under the water-closets, and *the space underneath is inaccessible*, it is doubtless becoming more and more offensive.

It cannot be called a nuisance of the first order though decidedly objectionable.

The boys' water-closets are properly left without doors. The *main soil pipe is not trapped* before entering the sewer, *none of the traps are ventilated*. It is true that the wastes from the house need not be directly connected with the sewer (as in the case of the girls' closets), but still the traps are liable to be syphoned out in several places.

DISTRICT SCHOOLS IN THE COUNTRY AND VILLAGES.

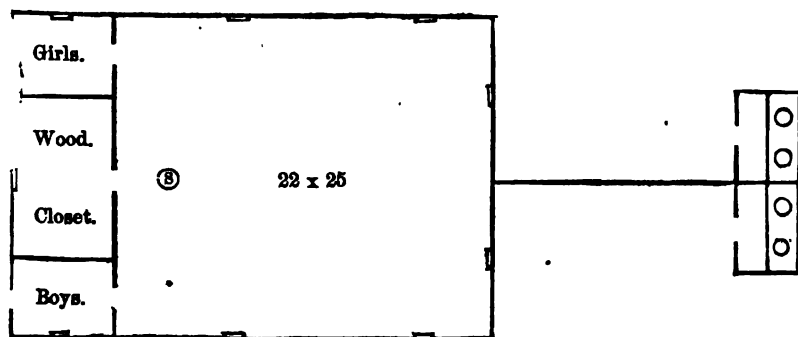
Number visited, thirty-three, viz.:

Brockport.....	3	Clarkson.....	8
Hamlin.....	10	Sweden.....	8
Ogden.....	3	Fairport.....	1

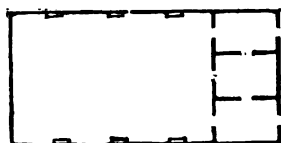
Information was obtained in one-half the cases either from the trustees or the teachers or school children and parents. In the remainder of the cases it seemed unnecessary to devote time to a tedious search in thinly settled districts for some responsible person. The type of house is not susceptible of wide variations, and in most cases a good view of the whole interior can be had without the formality of asking for a key.

Twenty-eight of the above list have but one or two rooms. One in Brockport has three; one in Spencerport, four, and one in Fairport, seven.

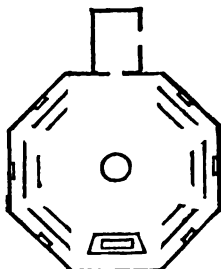
The typical country district school-house is planned very simply. It has usually a vestibule of some sort and an oblong school room with windows on two sides, frequently three. A school just built and not yet occupied shows the type perfectly.



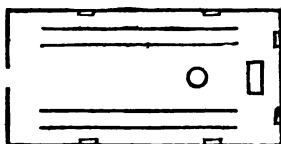
Here, the windows occupy three sides, an arrangement equally common with that on two sides, viz.:



One octagonal house was found so contrived that each scholar faces



three windows and the stove. One was found with the seats in four rows, facing opposite so that each scholar had two windows and a stove in front of him.



The light, at all events, was sufficient in these schools, however badly disposed.

In all the smaller schools the two sexes study in the same rooms, boys sitting on one side, girls on the other, but a separate entrance is often (and properly), provided with a vestibule for each sex in which their clothing can be kept apart. The water is almost invariably fetched from a neighbor's well and kept in a wooden pail. The heating is performed by stoves which never have jackets. An open scuttle often leads to the garret, and may serve as a ventilator if the roof is not tight, or more properly as a waster of heat. The rooms are often crowded; sometimes the reverse is true. The desks are generally of a very stiff and ancient pattern, the paint worn off, and the wood carved by the toil of many generations. The floors are apt to be badly worn, and if the walls are plastered (as they generally are) the plaster is pretty sure to be defaced and broken off. Nevertheless, among these little cheap buildings one was found quite new, and two or three others almost practically new and in an attractive condition.

As a specimen of what a district school *may* be, the following case is given: "An old wooden house of one room with a vestibule. It contained about forty pupils last winter. The floor has settled and a crack in the wall lets cold air in upon the feet. The privy is ten feet distant. The windows occupy three sides of the room. The house is greatly in need of a new floor, blinds and fixtures, seats, desk for teacher, plastering, stove and flue, water-pail, seats and floor for privy, and suitable vent holes for the sub-floor space."

The following details were noted:

Walls in seriously bad condition.....	4
Interior of house in seriously bad condition.....	2
A new house the best remedy.....	3
Sub-floor space not ventilated.....	6
No vestibule	4
Windows in front of scholars.....	4
Bad stoves.....	7
Seats new or nearly so.....	5
Privy, one single.....	4
Privy, one in two sections....	10
Privy has fence outside to separate the sexes.....	6
Privy has a vault.....	2
Privy is broken.....	6

The floor-space per seat in twelve cases, taken at random, equalled 8 8-10, 9 8-10, 11, 12, 12 1-2, 14, 14 1-2, 15 1-2, 20, 24, 25, 27 square feet. These cases indicate a great deal of over-crowding and such is the impression generally obtained from a look at the interior. As, however, the district schools are not usually in session at this season, it may be proper to qualify this remark, and also to refrain from expressing an opinion as to the probable state of the air in such rooms. The usual heater is a wood stove, a simple oblong box; sometimes a coal stove is used.

The state of the privies is inexcusable. It is unnecessary and wrong to expose children to the foul air which is almost invariably found in them. It is impracticable to have them under the shelter of the school-house as a rule, but they should at least be in good repair and made tight below the seats to exclude the wind in winter. It is a mistake to build two compartments separated only by board. The partition is generally cut through; and finally, if the teachers would consider this part of the premises as under their charge, much might be done to keep them neat; but very few female teachers have the courage for the undertaking.

The distance from the house to the privies was measured in some nineteen cases taken indiscriminately. One was in contact; eight others were within ten feet; seven from ten to thirty feet, and two at fifty feet. The distance of the wells furnishing the drinking water from privies, etc., was similarly noted in nine cases as respectively, 150, 140, 50, 35, 20, 30, (distance from a muck yard which imparted its taste occasionally) 6 feet (from muck yard in two cases); and in one case the well was *in* the muck yard.

The inquiry was put to all responsible persons who were found, whether any rule or by-law existed for the guidance of teachers in case of outbreaks of contagious or infectious disease. No person was aware of such a rule. No information could be obtained to lead us to suppose that evidence of vaccination had been required as a condition of entering or remaining in any of these schools. The two larger schools at Fairport and Spencerport were mentioned to us as worthy of separate visits.

The school-house at Fairport presents a fine appearance; has been built nine years. The plan is simple; a wide entry from front to

rear, and rooms on both sides. In two of the rooms the scholars face the windows. The air was uniformly close throughout the house, windows are closed; only twenty-five square feet of outlet (including gratings) from the rooms to the ventilating flues which draw sluggishly. There are 350 pupils. The mild temperature of the air from the furnace was noticeable. The latter is coated with masonry and enclosed in a brick air-chamber.

At Spencerport one ventilating flue discharged air from a neglected cellar into a school room. The roof is higher than chimneys so that back draught is frequent. The drinking water is from a neighbor's well twenty feet from a privy, and fifteen feet from an old vault.

BROCKPORT STATE NORMAL SCHOOL.

The State Normal School at Brockport is a large and well-known building, with an average attendance of from 550 to 675, of whom 350 are Normal and Academic pupils. The site is sufficiently elevated, being a piece of six acres, rising to a height of twenty feet above the street level at the spot where the house stands. The building is a long and symmetrical structure. Its two extremities are wider than the rest; they were built in 1868. Some of the rooms in that part are so arranged as to be very hard to light, owing to the great width of the building. There are four halls with easy stairs, cutting the house into five sections, besides stairs at the ends; there are eight doors of exit; there are two hydrants in each story suitable for attaching hose; and the general safety in case of fire seems sufficiently provided for.

Indirect heating by steam-boxes in the cellar has just been introduced. Each dormitory receives air from this source, and has an exhaust-shaft besides (a tin pipe six inches in diameter), leading to the attic, where all unite in three large shafts which discharge upward through the roof. The boxes discharge through metal tubes, one 46 by 48 inches in size, the other two 30½ in diameter. The current through the tin tubes was very active, and the amount exhausted probably sufficient, as the dormitories contain but one or two inmates apiece. The air seemed generally good.

The house contains two pan water-closets for the use of the sick, and a very few set basins and baths. The soil pipes are properly extended above the roof, and traps are put where needed, but not ventilated; the sewer runs along by the west side of the house on the outside; the connections with the house are trapped but not ventilated; point of discharge is 1300 feet distant. The privy, used by all the inmates, is about a hundred feet in the rear of the house, and approached by a covered way, with two doors to prevent a draught from entering the house. There is no excavation; a few inches of earth are thrown upon the natural surface, and fresh earth added twice a week; all is removed monthly; the odor is not excessive. The well for drinking-water is forty feet distant from one end of this privy, not on a lower level. The water used for washing comes from a very large cistern, filled from the roof, situated at a great distance; it is pumped to tanks, holding ten and eighty barrels respectively, in the attic.

It was recommended that the soil under the privy should be made impervious to moisture, or cemented or a dry-earth system, with barrel-tubs. Also, that hose should be supplied; that some rooms should re-

ceive inside blinds (for there are no blinds on any part of the house); that changes be made to secure proper lighting in certain rooms; that certain stairs be altered from circle to straight, with right angled turns; that a gymnasium room be fitted up; that the existing steam coils in certain parts of the house should be boxed and connected with the outer air. These suggestions were communicated to the trustees of the school.

PUBLIC SCHOOLS IN UTICA.

The site of Utica is on the ancient bottom of the Mohawk river. The soil is generally sandy and easily drained. The cellars of the school buildings do not suffer from dampness, drainage being applied as required. The site of Catherine street school is undesirable, being low and in the neighborhood of canals; there are three privies within fifty feet of the neighbors' well, used by the school.

The lots are usually small, but in good order. One of the schools is in an old church, and one in a two-story hall, designed by the founder as a free public lecture-room; in both cases the yard-room is exceedingly small.

The buildings are generally planned so that each story has one large study-room sufficient to seat all the inmates of that story, with annexed recitation rooms. A difficulty in lighting these large rooms sometimes occurs. In the newest house (James St.) the room is seventy feet across between the windows, and some deficiency in light may be expected, in spite of the very liberal allowance of glass. In Francis street school a room 30 feet square is badly lighted, having only two windows of medium size. The older plans are simple and possess no special merits; they usually have narrow corridors and defective accommodation for clothes, and lack the protection of vestibules and storm-doors. Remodeling has not been much practiced; but in the James street school-house a great improvement has been made in commodiousness, pleasantness and space.

Good care is taken of the houses, and the privies are remarkably neat.* As a rule, the latter have vaults which are flushed by the discharge from the roof, and empty at all times into the sewers; some of this class are remarkably free from odor. A good fence runs from the houses back between the privies. In all cases, when there are two entrances to the school-house, one is reserved for each sex. Separate clothes-rooms are assigned.

The condition of the cellars was neat and good, and the air pure, as a rule. The neatest cellar appeared to be that in Lansing street. All have earthen floors. Some cellar floor-drains empty into sewers, and some into privy vaults; they are said to be trapped, but the trapping is not ventilated, and as there is no "disconnection," a possible danger is to be foreseen there.

The chief point to which exception must be taken is the ventilation. The flues are small, built of brick in the outer walls, and open into the garrets; their action was very generally feeble, and their size altogether inadequate. Triangular tin ventilators have been placed in corners of rooms in some cases; the idea is a good one. The regulations, with the object of preventing colds, very properly forbid that scholars shall sit

* Washington street school forms an exception; some are unprovided with urinals.

in draughts ; but it seemed in some cases as if the fear of the outer air were carried too far. In one school, however, the teachers expressed pleasure at their opportunity for airing out the building, which the intermission afforded ; they staid over ; ate lunch, and kept the windows open until the school reassembled. In a great many of the small rooms it would be dangerous to open windows ; and the ventilating flues from this class of rooms were of the least possible value. The weather was very mild at the time of the visits (at the end of October) ; a high temperature in the rooms, say from sixty-nine to eighty-two degrees, was often noticed ; and a lower range, judging by sensation, was infrequent. Some window-boards have been placed under the sashes ; a more systematic use of them is desirable, as the most immediate means of relief. The Academy with its ample room and liberal entries, is the best ventilated building.

The recitation-rooms are the most crowded parts. In Francis street school there is one of fifteen by twelve feet in size, with an average constant attendance of thirty scholars (often thirty-five or forty), giving seventy cubic feet of space to each. This room has but one door and one window, neither of which can be open in recitation. In Aiken street school twenty-five pupils sit in a room which allows ninety-six cubic feet to each, with a stove burning, and a temperature of eighty-two degrees at the teacher's desk. In Miller street school there is one room with nearly forty scholars, and an allowance of a little over one hundred cubic feet each ; in another room with one window, thirty-five scholars, with seventy-two and one-half cubic feet each. In Lansing street school, a room eleven feet and two inches by seventeen feet and six inches, and thirteen feet high, sometimes contains a class of A B C pupils, fifty in number, which allows fifty-one cubic feet of air to each ! In South street school, one room, twenty three by eighteen and one-half feet, and only eight feet high, is divided in two by a board partition, and classes recite simultaneously in both, with closed doors (as is usual in such rooms). The average number in each of these classes being twenty, the space per head is eighty-five cubic feet. In Hamilton street school, one recitation room in constant use allows seventy-five cubic feet to each one of a class of thirty-three (average). These are not very exceptional cases. The houses in most instances have sittings for a larger number than the actual attendance.

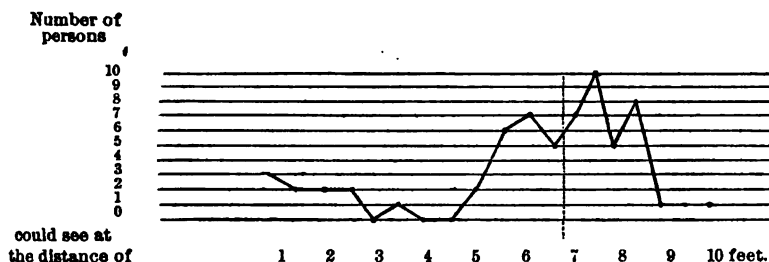
The administration of the schools is worthy of imitation in several points. The regulations in respect to contagious diseases are strictly observed ; a part of the credit for this is due to the city Board of Health. Vaccination is enforced, and teachers are required to attend to the enforcement by inspecting the children's arms. The direct personal influence of the superintendent (Prof. McMillan), is seen in the cheerful tone of the schools, in the neatness of the premises, and in the excellence of the singing and light gymnastics. There is a regulation forbidding detention at noon or recess.

In the Utica Free Academy an attempt was made to ascertain approximately the number of near-sighted pupils. The test was applied as follows :

A narrow recitation-room, well lighted from one end, was selected ; the black-board occupied one of the long sides, on it was marked a scale of feet and inches, the pupils were called in one at a time, and placed at a certain point close to the board, with their backs to the

window; at another marked point on the board the observer held a page of print, detached from R. Brudenell Carter's "eyesight, good and bad," which the author states, should be easily legible to the normal eye at the distance of seven feet, which was the distance in the present experiment. The page stood exposed to the light of the single window, nearly at right angles to the incident rays. The observer was able to read it at ten feet, he was instructed to cease experimenting when the light was insufficient for that.

Sixty-three young ladies were thus examined. The total number of Academy pupils was a hundred and twenty. Thirty-three could read the letters easily at seven feet and over; thirty had to go nearer; of the latter, eleven could not read easily at four feet, viz.: *three* read at one foot; *two*, between one and two feet; *two*, at two feet; *two*, between two and three feet; *one*, between three and four feet. The letters used were of the size following:



This diagram gives a view of the proportion of those who could see distinctly at the distances of the ten feet, and at distances between. Those of less than normal visual power are at the left of the dotted line.

No scientific value is attached to the experiment, but it may have its use in showing a larger amount of near-sightedness than was suspected.

EARTH-CLOSETS AND DRY-REMOVAL OR TUB-SYSTEM.

[Example at the Orphan Asylum, Utica.] •

The closets here described have been in use two years. They work most satisfactorily and are in as good condition as when first used, and as free from odor as after having been used for a month.

EARTH CLOSETS AND THE TUB-SYSTEM.

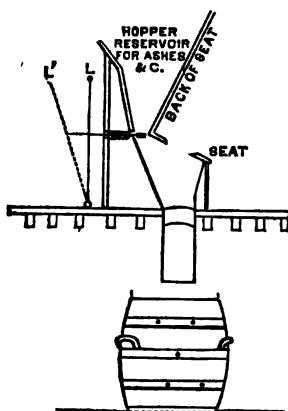
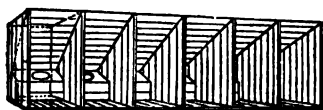


Fig. 18. Reservoir and hoppers for ashes and disinfectants behind the backs of seats.

L is a *lever*, which, when pushed or pulled back to L', opens a *valve* and discharges ashes, etc. The valve can be made to work automatically by special arrangement to secure action by the *seat*.



FRONT VIEW OF SIX CLOSETS.

The closets were constructed for children, and some arrangements are necessary that would not be required if built for adults. There are now about 130 children in the institution, aside from attendants, etc., all of whom use the closets. These closets are supplied with the anthracite coal ashes. The hoppers will hold several days' supply and are replenished by the janitor at such times as he finds necessary. There is an ash-room in which to store ashes. The levers or pulls, to shut the valves, are placed in the hopper reservoir, out of reach of the children, who otherwise would tamper with them. The levers are hinged at the floor, and arranged with a coil-spring to close them. Each seat or opening is connected with a galvanized iron tube extending to the cellar, through which the excreta fall. The lever when pulled opens a valve about four inches in diameter for discharging ashes into the delivery tube, and this into the tubes below, where the ashes fall and cover. Under each tube stands the movable tub.

Twice a day the janitor pulls each lever and lets a stream of ashes run. The tubs are filled in the course of a few weeks, and when filled and covered with ashes, and without charge, farmers take them away and return them empty and clean. No odor or nuisance is produced even in the cellar where the tubs stand.

SCHOOLS IN THE CITY OF ROME.

There are eight within the city's jurisdiction; all brick except two, which are of wood. Seven have two stories, and one has one. They are placed on lots usually of sufficient size, free from nuisances or encumbrances.

The soil is naturally of a character which renders special paving unnecessary, being a loamy gravel, very pervious to water. No school building has any drain or sewer, and all are free from dampness.

No house at present has a place to wash hands.

The water for drinking is obtained from wells usually sunk in the cellars. They penetrate a layer of considerable but varying depth of cobble-stone and gravel, and usually pass through blue clay below it before striking water, going to the depth of about twenty-five feet.

The water from five of the school wells has recently been analyzed by Professor Elwyn Waller, of the Columbia School of Mines; one has been found impure and the rest pure.

The school privies are situated at the following distances from the water supplies: Liberty street, 90 feet; Academy, 75; Jay, 60 or 70 feet; Thomas (25 feet deep), 45 feet. The privies are all of wood over simple vaults of masonry. The present superintendent says they have not been cleaned for a year, at all events. They have to be excavated in the usual old-fashioned way. Free use is made of disinfectants (copperas and lime), and the vaults at the time of my visit were not very offensive. They are objectionable, however, in other respects, being usually well soaked in urine. The urinals are troughs, without bottoms, discharging directly into the vaults. They are mostly of wood, saturated and offensive. A weekly cleaning of the wood work is directed, and doubtless carried out. There are in five cases two separate houses with a fence between; in three cases but one house with fence.

Distance from school-houses (in order), 45, 50, 10, 38, 12, 70, 30, 25 feet.

The school authorities have, within a very short time, caused the vaccination of the school children under the authority given by statute to exclude those not vaccinated. The teachers are made the judges of the need of vaccination; they decide by inspecting the scholars' arms. At the time of the visit the attendance was considerably diminished by the absence of those kept at home for the purpose. Contagious diseases are excluded by the teachers' authority in any case.

Among the school regulations are the following:

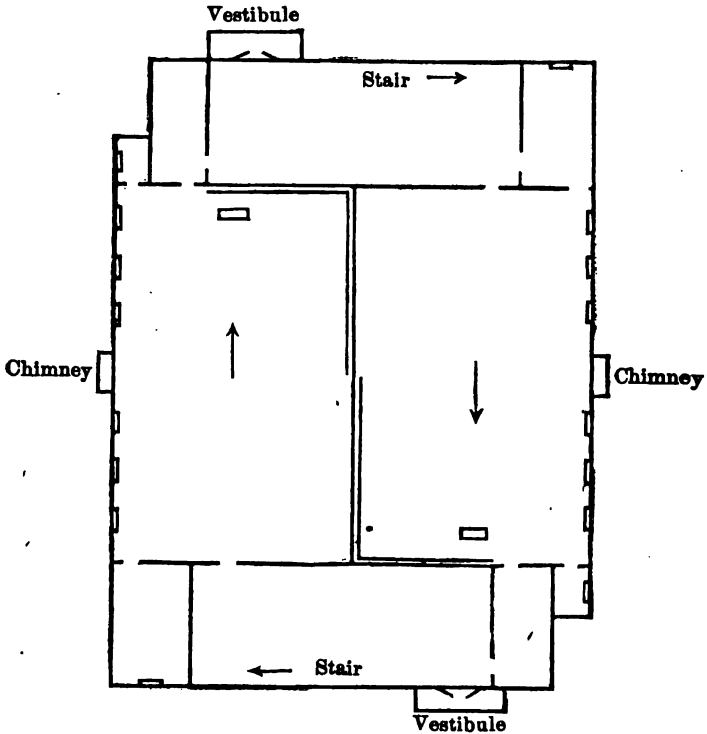
Pupils not allowed to play in streets in school-recess. Thermometer to be kept 65° - 72° . Windows not to be opened in school hours in cold season when ventilation can possibly be secured in any other manner. In no case may a child sit in a draft of air. Detention forbidden at noon recess. At any other recess the child, if detained, is allowed to go out for not exceeding ten minutes immediately after.

They sing daily; no gymnastics. Cabinet organs are placed in every school. Only one house is arranged for exercises in a common hall — (the Academy).

The rooms are usually heated by jacketed stoves. Two houses have cellar hot-air furnaces. Ventilation is effected by the windows almost entirely. The air of the rooms is to be changed at recess. Most rooms have transoms. A flue, drawing well, was found in Jay street in connection with the house chimney.

Much fault is found with the Academy building, an old structure very poorly lighted up stairs, and requiring frequent descents of stairs to and from recitations.

There is one wooden house formerly used as a dwelling, and decidedly liable to be crowded and dark. There is one recent building of wood, quite good. The rest are, in many respects, fairly good buildings, and one (the Jay street) deserves much praise. The recitation-rooms are often too small, and occasionally close.



JAY STREET SCHOOL, ROME.

Ground floor showing two class-rooms 21×32 feet each with 6 windows and ventilated by chimney; five closets; separate entrances for sexes. *Light from left side only.*

PUBLIC SCHOOLS IN ALBANY.

The city of Albany has twenty-six public school buildings, of which ten were visited, including specimens from the best, the worst, and those of moderate excellence.

The newest schools are decidedly the best, and constitute proof of an enlightened effort for improvement. In this class are included the High School, and Nos. 8, 13, and 21. In neither house can there be seen any radical departure from prevailing modes of building, and there are faults

to be found; but they are very fair specimens of the best types found during the course of the visitation through the State.

Vaccination was performed thoroughly last year, but very little attention is paid to the requirement in the regulations just at present.

The High School is a handsome building, near the top of Capitol hill, fronting the parks. It was dedicated, in 1876. The site allows very little yard room; the girls therefore, stay in at recess. There is a good room in the basement (48x29 feet) where the girls are practiced in light gymnastics at recess; one class of fifty comes each day, taking turns, so that each girl gets fifteen minutes practice once in four days. The boys play at will in the park (which is to be fenced, and play forbidden), or in a large basement room. There is a handsome and lofty hall in the third story, 80x58 feet on floor. The interior finish of the house is in hard wood. A corridor, fourteen feet wide, cuts the house in two; a flight of stairs is at each end of this corridor; and in the second story a branch corridor, 20 feet wide and 52 in length, leads from the middle of the first corridor to the front of the house and a third flight of stairs. The effect of this is excellent from an esthetic, and doubtless also from a sanitary point of view. The first two stories are 14½ feet high.

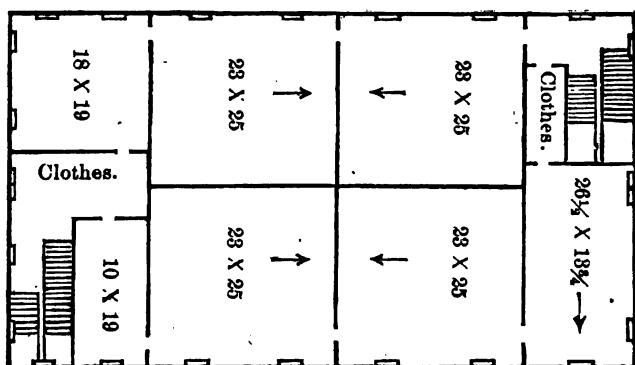
The house is heated by steam coils in the rooms. A slot in the house wall opens just behind each steam coil; but all these slots have been stopped up by birds' nests; they are hardly more than an inch wide in their narrowest part. On the day of visit the air outside was warm (47°-50°) and bright, with little wind; the rooms were warm, the average temperature of seven being 73½° F. Some were close; on the whole, ventilation was tolerable, not excellent. The flues were drawing very unequally. All the registers were tested; two rooms were found without flues; five flues were not drawing at all; eight drawing very weakly; five moderately; five fairly well. A rough estimate gave a probable exhaust of 3000 cubic feet per minute, for 600 pupils, or five for each per minute. The windows were open a little at the tops in most rooms. The floor space for scholar in the large study-rooms is nearly fifteen square feet; and about 215 cubic feet of space. The recitation-rooms have a nearly proportionate capacity.

The deficiency in light is marked in certain rooms. In the largest size of study-rooms the amount of glass was $\frac{1}{8}$ of the floor-space; in the next size, $\frac{1}{4}$; in the smallest size, about $\frac{1}{15}$. The width of the room is too great (30 or 32 feet).

The water closets are in the cellars. The urinal was rather offensive. The pattern of the water-closet is the usual hopper which frequently gets choked; there is too much woodwork about them; too little light.

School No. Fourteen is a three-story brick building, of which the second story is here given in plan. The light is obviously deficient in four of the rooms on this plan, the window space equalling only one-thirteenth of the floor-space. There are fifty-six desks in each of these rooms, with a floor-space of 10.3 feet to each. The narrow corner room has fifty-four desks, all filled, with an average cubic space of eighty-seven feet to each. The house contains 928 sittings, and has an average attendance of 880 of all grades below the High School. The ventilation is by flues opening into the attic, and is quite defective. Vaccination has not been required this year. There are only twelve seats in the boys' privy; they are unsuitable in size, and badly fouled. Clothes are hung in two passages containing 160 hooks in three rows

(on the second story). This is the provision made for a seating capacity of 318.



School No. Fifteen is a three-story brick house with six rooms on a floor; a hall eleven feet six inches wide, with deep bays at the room doors, runs through the center. The average attendance is 825; average floor-space for each sitting in the house, 10.5, equally divided. The house is heated by direct radiation from steam-coils. The lighting is sufficient in most of the rooms. The ventilation is not quite satisfactory, and the house is, perhaps, built upon too extensive a plan, with too many rooms upon a floor.

Second District.—The house has three stories, all alike; with corridor in front, then a room 47x24, and at the rear of the latter a recitation-room, 14x21 1-2. The recitation-rooms are used constantly; the cubic space per head varies from 56 to 59, 74, 95. It was very dark and close in the larger rooms. A house stands within one foot of one side, shutting off the light completely. On the other side the nearest window to the front of the room is sixteen feet back. When the wind is from the south, one furnace fails to heat the room above it. The privies were not offensive; water is frequently thrown in from hydrants, which are sometimes let run all night. The house was built in 1832, and hopes are entertained that it will be superseded by a fitter structure.

School-House No. Seven was built in 1838. It stands at the foot of Capitol hill, on the north side, where the slope is so steep that flights of steps are used to ascend it. The light is also cut off on the west by a house, ten feet distant; on the east by a school-house built four years ago (No. 19.), distant thirteen feet; and on the northern light is prevented from entering the rooms by the fact that the corridors occupy that side. Gas is used frequently; in the lower story it is required in winter during half the time. The sky can hardly be seen from the lowest class-rooms. The first-floor recitation-room contains a furnace, designed to heat also the two rooms above it. The number usually present in this room is thirty-eight, with a cubic space of sixty feet each. The temperature of the room at the time of the visit was 78° F. Here was seen the grotesque spectacle of a room full of boys kneeling on the floor and ciphering with their slates on the settees—an arrangement based on common-sense, and showing an adaption to diffi-

cult circumstances. Other rooms are not warm enough in severe weather. No means of ventilating exist but windows. The new school-house does not at present very seriously interfere with the lighting of the old one; for, as the plan shows, there is but one window on that side in each story. It interferes very much with any prospective improvement in lighting. Vaccination has not been practiced this year. It is usual to require it, and to examine the scholars' arms in evidence. The omission of the school recess is liked.

School No. 19, next door to No. 7, is for primary children; it has two stories and four rooms; each room eighteen by twenty-four and one-half feet with fifty-six seats. The rear rooms, although facing the side of the hill, have only four windows, while the front rooms have five; the lower rear room suffers for want of light.

There are two hundred and twenty-four seats, and an average attendance fluctuating above and below that number, Cubic space nearly ninety feet per head. The sun was shining brightly, the air outside was at twenty degrees Fahrenheit; windows were open in the room, and the air was not very bad. The open windows seemed to occasion colds, and coughs were frequent. The ventilating shafts are insignificant, and are so placed as to waste the heat. Whatever ventilation there is, is aided much by the open plan of the house, as may be seen. There is no cellar, and the openings to the sub-floor space make the lower room cold in the floor; the teacher complains much of it. It is said that the sewer from the privies runs under the house. In regard to vaccination, the parent's word is taken in evidence of the fact. Calisthenics are practiced for ten minutes in each session. All are content without the "yard recess."

School No. 21 has a nearly cubical shape. The basement is on a level with the street, and contains furnaces, play-rooms, and a principal's private room. Each of the three upper stories has a wide corridor running through the middle; on each side of the corridor there are two classrooms with two very large and commodious clothes-rooms. The twelve rooms are all of the same size—twenty-five by thirty by fourteen, and being all corner rooms, each has two side and two rear windows. The average attendance is five hundred and sixty-four, which allows to each scholar an average of two hundred and twenty-three cubic feet of space in school-rooms. The house stands freely exposed, in a thinly-settled quarter. All these circumstances favor good ventilation; and the result is good. How much influence is exerted by an exit of less than half a foot of practicable aperture to each room, may be questioned; the draught, however, at these exits was very good, being sustained by the heat of smoke-pipe. The privies are situated in a row of dark, dungeon-like brick cells at the end of the yard; the seats are too high for young children; there is no door, but high screens, and inspection of the localities is very difficult. It is said that outsiders visit them. The woman janitor naturally does not do police duty. All is neglected. The place shows proof of serious lapses from the customs of civilized life.

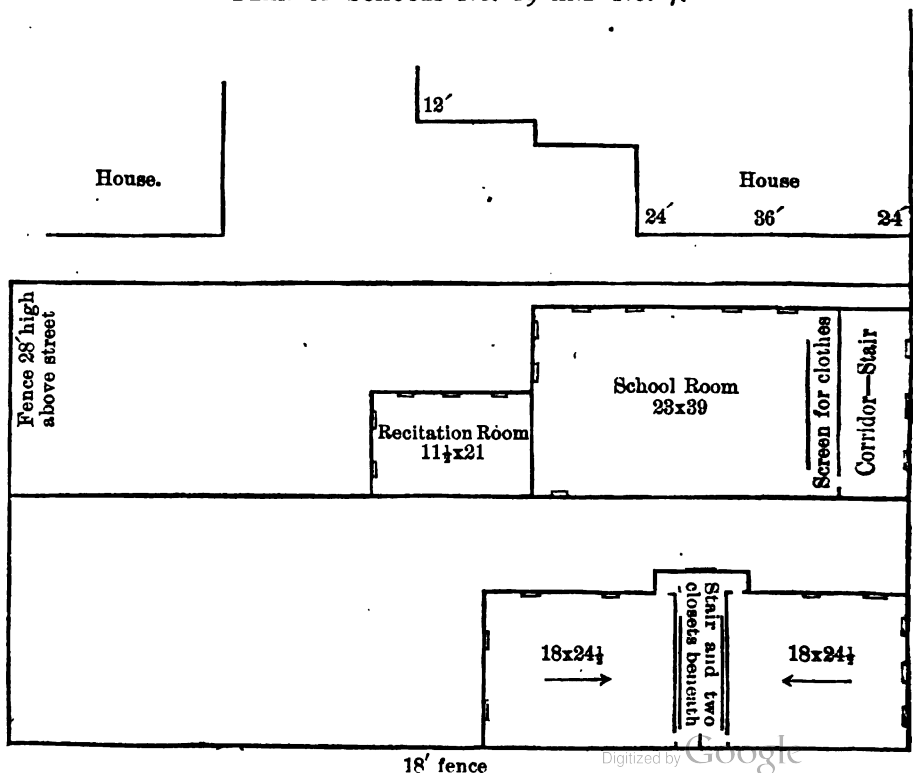
School No. 8, is just completed, and is an attractive and desirable house. It has two stories, with four rooms in each; and a corridor through the middle with front and back entrances, and doors swinging outward. The interior finish, in wood and tinted rough plaster, is noteworthy. The ventilation is secured by strong draughts through

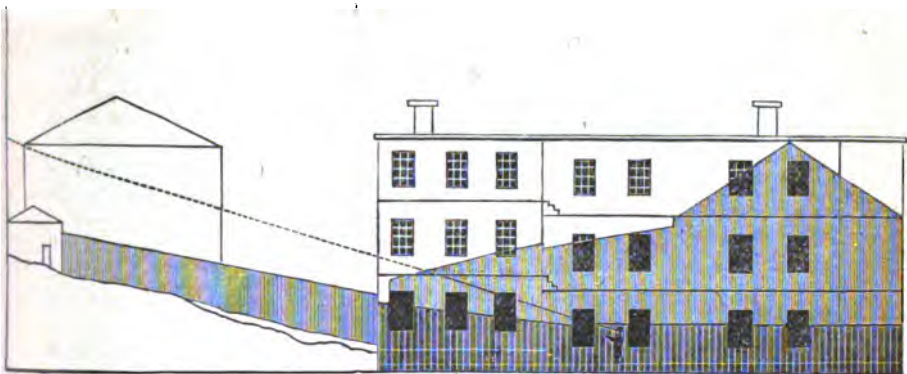
flues heated by furnace smoke-pipes. Each flue exhausts from two rooms in different stories. The water-closets are of a new pattern which works well and deserves praise for neatness.

School No. 17 is built upon a plan resembling that of No. 14. The means of ventilation are very deficient. The size of the rooms is 28' 2" x 20' 4" and 15' high = 8595 cubic feet per fifty-six pupils = 153 cubic feet apiece. There is abundant light, and a relatively good supply of air from the furnace. On putting the question to the teachers and scholars of the four lower (primary) rooms, it was found that the subject of vaccination had not been mentioned during the current school year, and that twelve children were unvaccinated in a total of about 160 present.

The Albany Academy is not a public school. It was built in 1875 for the present use, upon a broad and handsome scale. The rooms are large; in fact rather too deep (thirty-four feet) for thorough lighting. There is a good play ground, but it is not much used by the boys, who prefer the Park. The older half of the school is drilled with muskets twice a week from twelve to one o'clock by Col. Pfisterer. The school-hours are from nine to two for the older boys, with twenty minutes recess; for the younger from nine to twelve or twelve and one-half. From one to three hours of study are required at home; there are twenty-five boys who average four hours a day. The school-house is neatly kept, but the air is rather close, and there are no means of artificial ventilation worth mentioning. The privy accommodations are much too small.

PLAN OF SCHOOLS No. 19 AND No. 7.





School No. 7, Albany, longitudinal section, from front on Canal St. to a fence 28 feet above street level, in rear. The outlines of the house beyond, distant 10 feet, and the fence distant 4 feet, are given with shading; the windows which are obstructed are given in full black. The dotted line is the direction of the visible horizon (Elk St.), which the boy is looking at.

PUBLIC SCHOOLS OF SCHENECTADY.

There are nine school buildings with about 2,000.

Soil of city, sandy. High ground in north. Slopes down to Mohawk river. On high ground are three schools; on medium ground three, and on a site bounded by the Erie canal, and 6 feet above its water are three more. Soil water moves down from bluff towards river. Town is supplied with water chiefly by wells of moderate depth and generally pretty near to privies. No proper system of sewerage exists. Only two schools are provided with city water (Mohawk river by Holly system); the rest have no drains.

Water in some wells in low parts of city is known to rise and fall with changes in the canal; this is true of the water in the well used by the large group of buildings called the Union School.

The privies have vaults, and proper separation of the sexes is made (with one slight exception). They are distant from forty to one hundred and fifty feet from the houses and from the wells from 100' to 150'. Their condition was noted as filthy in one case. In another the boards are soaked and the whole concern offensive (without neglect on part of the janitor). The floors are old and worn, and holes are bored in them to let water run into the vaults when they are rinsed. In the house in White street and one in rear of Union School, dampness was much complained of; there were no cellars; insufficient ventilation under floors.

Heating and Ventilation.—Direct steam in Park place school (the newest school-house) which has ventilators of insufficient size, but drawing strongly. The clothes-rooms are in the cellars, which have no ventilation.—(Albany Hill.) Mere apologies for ventilation open into attic. Heated by hot-air furnaces. Children's clothes kept in same room with furnaces (cellars) and air for furnaces drawn from those rooms.—(Union School.) Partially heated by furnaces; clothes-rooms not separated from furnace rooms, and the supply of air taken from

cellar indiscriminately. There are also stoves, and much complaint is heard on account of the gas. There are some flues for ventilation.—(Rear of Union School.) Two buildings. Hardly an apology for ventilation.—(Albany Hill, annex.) Air usually extremely poor. Flue from middle of ceiling through roof. The air comes *down* it, cold.—(High street.) Constant opening of windows gives air of moderate tolerable goodness. Stoves, gassy.—(White street.) No ventilators. Gas from stoves. Very close, poor air.

In general, ventilation depends on windows; teachers are sometimes reckless in exposing scholars to draught and sometimes seem to disregard the need of opening windows at all. There is no "system" of any efficacy in comparison with requirements.

Bad lighting is frequent; light in front of pupils; in front and on right side; in front and rear only; repeatedly in each case. No system. There are some rooms in the Union School of preposterous forms which cannot possibly be well lighted, *e. g.*, a room 67x27 and window; at the two sides only twelve feet high.

Vaccination not insisted on. A strong German opposition prevails. In contagious diseases the certificate of physician is required before a child returns to school.

The experiment of omitting *recesses* (except in the lower grades) is now being tried for a month. This makes the school hours at present, 9 to 11½ A. M. and 1½ to 3½ P. M.

PUBLIC SCHOOLS IN BATH-ON-THE-HUDSON.

On a lot which should have been larger and might easily have been made so, stand an old and a new school. The site is the slope of a bluff, one-third of the way up. Six streets not thinly settled, run parallel to the river on this slope. All the houses have pit privies; there being no sewers. The soil is clayey; near the foot of the bluff stands the well which supplies the school with drinking water. The yard is muddy; the school-privy is thirty-six feet from one school and eighteen feet from the other; it is in two sections with seven seats in each; back to back with board partition; the floor is defiled; the vault consists of a series of square wooden boxes quite full, which are removed from time to time. There is no partition between the sexes in the yard; they have their recess at different times, and this again prevents thorough airing of the school at recess time.

The old house originally formed a parallelogram (31x46) but wings have been added so as to cut off half of the windows on each side and leave it quite dark in portions. Four of the stoves connect with one chimney of three flues, the central flue alone being carried through the roof. A week ago it was discovered that two of the stove flues were connected with side flues in the chimney so that the smoke entered the garret and filled the house. Water stands in the cellar in the spring; it is full of decaying old lumber. The ceiling has repeatedly dropped large pieces upon the desks. The floors are in poor condition, the desks ancient. The doors open in, and on the stairs half way down there are doors swinging inward. The air is poor.

The new house is used by primary pupils. A house twenty-four feet high stands twelve feet from one side opposite two windows; another

house opposite one window on the other side; this should have been prevented by a larger building area. One room was well ventilated; another was said to be so. Another (said to be very close) measures 15x30 feet and has an average attendance of eighty-six pupils, of the age of 6.3 years. This allows scarcely more than five square feet of floor-space per head.

* Cases of contagious disease cause the exclusion of the whole family; such cases are found out in various unofficial ways. Vaccination was enforced last year, but it is not now, and probably will not be until a new epidemic occurs.

PUBLIC SCHOOLS IN COHOES.

There are eight school-houses and an average attendance of 1567 children with forty-two teachers in Cohoes, giving an average of fifty-seven pupils to each teacher.

The experiment of omitting the fifteen minutes recess in each session has been tried for a year with apparent success. The hours of school have been reduced from 9-12 A. M. and 1-4 P. M. to 9-11½, and 1-3. The teachers of primary classes have the option of dismissing at 11 and 2:30, but do not all exercise it. Gymnastics are practiced to some extent by primary classes. It is thought that by omitting recesses a great deal of evil communication, obscenity and profanity is prevented and that the scholars get along very well without the intermission. The children used to come in dirty and excited and ten minutes were lost before they were fully able to work again. The suspension of work for five minutes at the close of each hour, with physical exercise and opening of windows, is recommended, but is not carried out by all primary teachers. The programme of the day's work of one primary class is here given:

Hour.

9-9:30 Addition by all.

9:30-10 { Subtraction.
Study of lessons. } Alternate days.

10-10:30 Arithmetical tables.

10:30-11 Music, fifteen minutes; study spelling, fifteen minutes.

11-11:30 Table class.

1-1:30 Spelling (by all.)

1:30-2 Arithmetic tables by those who have not recited at ten.

2-2:30 Write one day; draw the next fifteen minutes and study of reading lesson for fifteen minutes.

2:30-3 Reading lessons.

Members of a family where contagious disease exists are excluded. There is no enforced reporting of cases to the Board of Health or school board. The regulations order all unvaccinated children in attendance to be vaccinated, and it is required that no scholars shall be admitted without presenting to the teachers a medical certificate or other evidences. The rule was enforced last winter by the health officer, who personally visited the schools and performed vaccination in all needed cases. An epidemic of small-pox was then raging. A similar enforcement was made during a previous epidemic, seven years ago. In the intervals no effort is made and no record kept on the school books. The results are, that scarcely any above the primary grade are unpro-

tected; but as regards those in the primary grade the protection will be less certain.

The duties of superintendent are devolved by the regulations upon the principal of the high school. This gentlemen has already fully enough to do in hearing seven recitations a day.

As a general thing ventilation depends almost entirely upon windows. The preferred plan of building seems to be that of four rooms on a floor divided by one corridor. The newest houses are the best and most attractive, with the exception of West Harmony school. The crowding of schools is not a very marked characteristic. As will be seen, there is much neglect to janitor's work, *and inattention to details of repairs.*

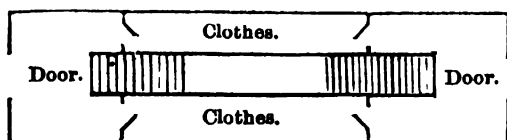
The High School was formerly a dwelling-house; it has three stories and a basement. In the basement one room is used for primary scholars, average attendance sixty-two, floor-space eleven feet each; cubic space per scholar ninety-nine feet. The light is poor—two small windows in front of the scholars and two behind equalling one-thirteenth of floor-space. The room is three feet below the ground. The first story contains one room with forty-three children of ten years of age in attendance, and a floor-space of ten feet each; one hundred and twenty cubic feet each; light insufficient. Another small room contains sixteen pupils of the age of sixteen; it is much complained of for closeness, and has no inlet or outlet for air. In the third story there is one large room for the high school, with an allowance of twenty-four square feet of floor-space apiece. The house has two stair-cases and a fire-escape. There is one hot-air furnace—but not equal to demand. There is a sufficiency of wardrobe space. The water-closets are placed in a three story L. Those in the second and third stories are used by girls exclusively, which seems a very proper arrangement. The one in the first story is foul and wet; one closet gives no stream, while another throws water upon the floor. The number of seats (8) is too small for an actual attendance of over two hundred. The pattern of hopper used is poor, and the supply of water, at times, insufficient.

The White Street School has two stories. In two large rooms the pupils face a bright light. The floor-space in three rooms (primary) was noted as eleven, eleven and sixteen square feet per head. The clothes are kept in neat enclosures in the corridors, eight feet by four feet; the wall or fence being only eight feet high. There are two flights of stairs. The outer doors open outwards. The house is heated by direct radiation from steam coils. There are eight ventilating registers in each story which do not draw, they seem to go to the attic which has at the top one round ventilator. The water from the yard occasionally runs into the cellar; the latter contains a drinking faucet, and also five hoppers (very poor articles), and one broken pan-closet. The school board is about to introduce much better arrangements. The boys' privy, only twelve feet removed, is in a bad condition. The floor is broken through. It contains only six seats. The number of sittings is 342, and attendance somewhat less.

Columbia Street School was seen after hours. It has two stories with four rooms on each (28x30 feet). In five rooms the seats faced a strong light. It should be remarked that teachers "generally keep the shutters closed" when in front of the pupils, not always however. A very

rickety pattern of desk and seat was noticed in one room with its wood-work fastened to the iron by light screws.

The clothes-closets are peculiarly arranged. The corridor runs through the middle of the house with a stair facing each entrance door. The midspace is thus occupied by two flights of stairs and the passages on each side are converted into closets by simple partitions, thus:



This saves space but interferes with free diffusion of air. The house is heated by steam coils in the rooms. In two rooms there were found no ventilator-openings, in three the valves could not be opened; in one other there was a slight current. The cellar was full of rubbish and the sweepings of the rooms. The two privies touch the house at different corners. That for the girls has six seats and is neat, a hydrant runs constantly in the yard and the water flows through the vault. The other privy has no urinal; the seats are too high and strangely inconvenient. The floor is covered with ordure and has great holes broken through. The door is stuck half-way. The vaults are cleaned once a year.

East Harmony School contains three rooms in a basement and two upper stories. The basement room is deficient in light. It contains a portable furnace for warming the two upper stories; the air supply is drawn directly from the room over it by a pipe. The windows in the house were generally well open. Some obsolete registers admit currents of cold air upon the scholars, and are therefore disused as ventilators. The water supply is taken from a hydrant. The house is of recent construction and is pleasant and neat. The children are taken from the poorest part of the population.

West Harmony School is a three-story brick house not fully occupied, on a magnificent site. The first thing noticed on entering was the darkness of the corridors and stairs, which receive no light except what comes through small transoms in the doors of class-rooms. There is but one stairway, of a single run, five feet wide for each story; this may be considered unsafe, under the circumstances. A musty smell was perceived in the corridor at once. The door was open to the cellar; on descending the latter was discovered to be almost wholly underground and totally dark, except in one small corner. With the aid of a lantern and a strange odor as a guide, the soil pipe was at last reached and was found to be leaking upon the earthen floor. The leak had been partially stopped with canvas and paint — if that were not the original joint. The house contains six rooms used for hanging children's clothes; each of these rooms contains three hopper closets of poor pattern, and two contain urinals. There is no separation by door between the clothes and the water-closets. Garments were hung thickly and strewn on the floor. Each room opened *directly* into a full class-room, the teachers of which made bitter complaint of the nuisance. One of these closets was found very offensive, reminding one of the smell of a filthy lunatic's cell. The others were neat, but the hoppers were mostly broken or out of

order. The boys go to a building that touches the house. It has two doors, one locked, the other evincing long neglected defilement; only two seats; the asphalt pavement outside is preferred by the boys. The yard fence is broken. The washing of the school floors is said to be neglected. The house is heated by direct radiation from steam coils. In most of the rooms windows were wide open; the temperature of the house averaged 71° and that outside 40° . The ventilators are not to be relied on. The roof is leaky, and air currents enter the third-story rooms freely. The floor-space per head of actual attendance was 11 1-2, 11 1-2, 12 and 15 (primary), 11 1-2, 16, 12 and 24 (higher grades).

Pleasure Ground School is considered the best in Cohoes. It has two floors, each with two rooms and a good entry and stair between. Ventilation depends on windows. There are in each room two orifices of eight inches in diameter. Stoves are used. In one room there are seventy-eight little children from five to seven years old (floor-space nine feet each), "and ninety-six belong." Size of rooms, 30x23. The girls' privy is thirty feet from the house; the boys' is 120 feet distant, has sixteen seats and is perfectly neat, but the trough was very carelessly fastened and is broken down.

Lincoln Avenue School is a two-story wooden house, neat, pretty, and convenient. One room in each story (23x22); lot 132x120; stove heating.

Slate-yard School comprises one room in a wooden house, poorly lighted but not crowded.

PUBLIC SCHOOLS IN WATERFORD.

Union School No. 2.—This school building stands on muddy and loamy ground, encircled by the Hudson and Mohawk rivers and a canal. The river sometimes overflows the ground it stands on. At the time of the visit the teacher said that some of the pupils were absent on account of malarial fever. The house requires little further mention, having but one room, not crowded. Scavenging of the privy had not been neglected.

School No. 3.—This has two rooms; in one the cubic space is ninety feet per scholar, in the other, 210. The temperature was at 84° F., estimated, but no thermometer was found in the schools. Sewer runs through school-yard—empties in canal.

The Academy.—This is an old three-story house, poorly fitted for the purpose it serves. The ceilings are nine and one-half and ten and one-half feet high; the windows insufficient, and some rooms very poorly lighted; the rooms generally rather crowded and small—e. g., a classroom of 18x33x9 1-2, and fifty-five pupils in attendance, giving 100 cubic feet of space to each, and others similarly situated. The ventilation, it need not be said, is very imperfect. The cellar is dark and unaided. The privies are much too small.

Vaccination was practiced in the town last year, with the effect of checking an epidemic of small-pox in the beginning; it is not systematically enforced in the schools. Much contagious disease is believed to be concealed. The presence of measles in a household excludes those who are sick, but not other members of the household.

PUBLIC SCHOOLS OF TROY.

In this city of 60,000 inhabitants there are sixteen public school-buildings with 8,738 registered pupils, and an average attendance, for ten months previous to July, 1880, of 5,613. This disparity is due

to the large inducements to profitable labor at light employment, which are offered in Troy and in some of the neighboring places as well. It is estimated that there are over 13,000 persons from five to sixteen years of age in the city.

The schools are greatly overcrowded, and in numerous cases the lighting of the school-rooms is excessively bad. The ventilation is generally poor, as might be expected. In a considerable number of instances the superintendent, Mr. David Beattie, has procured the insertion of new flues made of tin, one foot in transverse section, which are carried from the level of the floors directly through the roofs, and capped to prevent rain from entering. These flues are encased to shield them from cold air opposite entries where it is necessary to pass them; they are not exposed to the outer atmosphere and they were found to draw quite well in every instance where these conditions were strictly fulfilled. They are opened only at the base. Artificial heat, by gas or oil, and an increased number of flues, is required for perfect success. Windows are generally found open in moderately cold weather.

The houses are generally planned with large study-rooms, and small recitation-rooms attached. In five houses glazed partitions are used.

An epidemic of small-pox broke out in Troy, in August, 1880, and lasted until June 10, 1881. Of 806 cases 248 died. The Board of Health ordered the exclusion from the schools of all who could not show a physician's certificate of vaccination, or of immunity from small-pox. This order was enforced, but there were numerous instances of refusal and consequent exclusion from school. The teachers are frequently reminded of the existence of the regulation; they do not possess the discretionary power; nor do they examine the children. If contagious disease appears in any member of a family, all are excluded from school until a physician certifies that they may safely attend. Information is obtained in any available way.

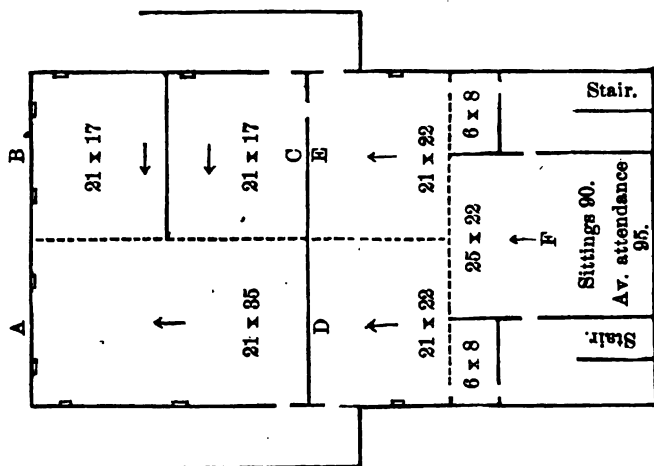
The schools are mostly well placed. The lots are in some cases so small that the erection of neighboring houses cuts off most of the light. In three cases (1st, 9th and 10th wards), the cellars are damp, occasionally or constantly, from inflow of spring and surface water. In one school two lady teachers were seen in the yard at recess time, actively engaged in police duty among a boisterous and mischievous group of boys. This part of school-duty is certainly useful if not agreeable, and is probably well performed in Troy.

First Ward School No. 1 is a two-story brick house, the first story of which is properly used for class purposes. In the second story there are two recitation rooms, 14 1-2 feet square, one of which has regularly from 45 to 60 pupils in attendance; when the latter number are present the cubic space equals 43 2-3 cubic feet per head. The ventilator flues are very small, and open to the attic. The air is very close in the large room, which seats 120 and averages 130 in attendance. There is no urinal. This school is located in a region of the lower class of population. It appears very well managed.

No. 2 is in the best part of the city. It is a building with pretensions to elegance, but is placed on a very small lot, and on low ground. The attendance averages 456; the sittings number 668. The house is 72x75 feet, three stories high. The ventilation seemed very fairly good in the

large rooms (whence usually a portion is absent reciting). This stands related to two factors. First, the amount of space (nineteen square feet of floor-space per head for average of all the rooms); and, second, a good current into brick shafts, one on each side, 4 feet square internally, containing a steam coil. If the seats were all full it is safe to say that the atmosphere would be less pure. The partitions are of glass and very poorly made. The clothes-rooms are very small. The boys' water-closets in the cellar are well lighted but are badly worn; the smell is peculiarly unpleasant.

Second Ward School. Floor-space per pupil on first floor rooms 13, 9, 5.7, 11.5, 5.5 square feet each. The second floor is similarly crowded (8 and 9 feet). The light is very bad. In A two of four available windows are in front. In C, D and E there is one window each. Blinds have to be closed in C and E when the sun shines. Ratio of glass to floor-space in A = 2-17 inches; C = 1-17 inches; D and E = 1-22 inches apiece. The following diagram will give an idea of the school.



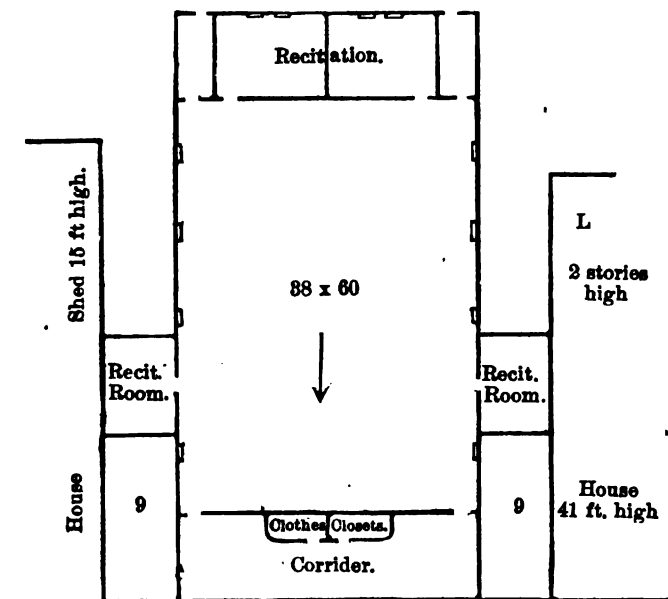
SECOND WARD SCHOOL, TROY (first floor).

The air for supply of furnaces is taken in part from cellar and front entry. Ventilation is not steady and chiefly into garret. A spring of water runs under the house and rots a portion of the partition in entry. The privy is 25 feet distant and overflows into a street sewer. Clothes-rooms deficient. Floors and windows not washed for ten weeks.

Third Ward School. The first floor recitation-rooms average a floor-space of 4 4-5 sq. feet per pupil. One recitation-room on third floor often has 30 pupils of adult size (High school) for thirty-five minutes at a time, giving less than four square feet of floor-space to each. The light is extremely poor in the rooms on the first floor especially. For three weeks during last December the scholars wrote but once for want of light. On this floor the sittings are 216; average attendance 240-260.

The wardrobes on the first floor are two in number, each 8x4 1-2 feet. without light, and kept locked. The cellar is not neat. Waste from trapped basins one on each floor goes to privy vaults, which overflows into a sewer.

Below is the plan of the first floor showing obstructions to light.



Fourth Ward Grammar School. The first story is eleven feet high; floor-space per head equals from four to six square feet. The second story has, in recitation-rooms 60, 108, 108 cubic feet of space per head, and the principal *thinks* that ten per cent of those that have been there three years have defective vision. The closets are very small and dark. The floors and stairs are old, poor, and badly worn; the stairs are too narrow and dark, having no window. The windows are practically the only means of ventilation, and the air was far from good. The light is very poor in many parts of the large room. The defective points are as follows: (1) The scholars face three windows. (2) The rear end extends eighteen feet back beyond the side windows. (3) There is a two-story house, painted brown, on one side eight feet distant and covering all the windows on that side, and (4) the windows are small and ceilings but 11 feet high. The drinking places (trapped) and the privy drain to a sewer.

Fifth Ward School, No. 1. The house is greatly overcrowded. Several children were seen sprawling on the platform in both stories. In the first story the attendance was 165 (average) and the number of sittings 140. In the second the attendance was 130, number of sittings 108. One recitation-room had three and one-half square feet floor-space per head; two others had under six feet. The house is aged and the wood-work is cut and worn. There is no cellar only a sub-floor space. The privies are poor and nasty, and urine stands on the floor; they occupy the highest part of the lot, which slopes steeply to the house at the lower end; a contamination of soil probably occurs. In

fine, the children's faces were dirty; this was but in harmony with the surroundings.

Fifth Ward School, No. 3, is an old wooden house formerly used for liquor selling and prostitution. There is but one room twenty-one by twenty-nine in each story. Pupils number 150-160. Their behavior and attainments are said to be excellent; their parentage good. The rooms are exceedingly inconvenient as well as crowded. It is almost impossible to get good ventilation. In the rear on rising ground is a poultry-yard adjoining the house; also a privy, a little farther up, without a door, minus half the roof, and facing the street at a very short distance; there is but one for both sexes; one vault after another has been dug, used and filled in without being cleaned.

The Sixth Ward School-house is four years old and is well built except as to the floors in two of the three stories. There are good stairs, two good wardrobes on each floor, and a high and dry cellar. The site is on the verge of a high, steep bluff. The house is less crowded than some others; one recitation room however (15' 6" x 22' 8") has seventy or eighty children, or four and one-half feet floor-space to each. The two privies are only twenty feet distant, smelling badly, and not properly emptied and repaired. The inlet of air to the furnace is just opposite.

The Seventh Ward School is an old brick house of two stories. The first story is a solid block of four rooms, parted by glass sashes. It is entered directly without a vestibule from front to rear. To get to the second story it is necessary to pass out of doors. There is one stairway at each front corner; the stairs are three feet wide, have one sharp turn, and are lighted almost wholly from the door (if that happens to be open). The clothes and umbrellas are kept in the rooms. Of eight side windows, two on one side and one on the other, are almost wholly deprived of light by neighboring houses. In the second story, the large room (forty-eight by thirty-one) has only three available side windows (one-thirty-seventh of floor-space) and three in front of scholars; in fact the lighting is of the worst. There are no corridors or vestibules. The first floor contains about 1,800 square feet, average attendance 230, sittings, 220, floor-space per head equals eight square feet, Second floor, attendance 150; floor-space per head, twelve square feet, but with much closer crowding in recitation-rooms (five and three-fifths, four and four-fifths, four and one-half square feet to each child). Excessive stove-heat. Ventilation by windows; flues feeble. The privies are very dark; that for girls has no light when the doors are shut, and an eight foot screen is close in front. The yard drains into the vault and the latter into a sewer. The cellar is very dark.

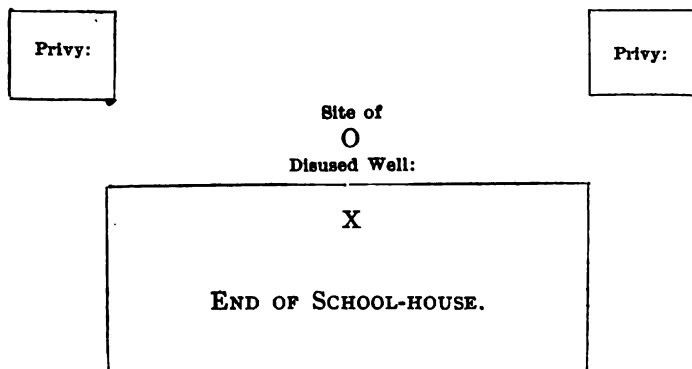
The Ninth Ward School is in a malarial district and was closed two or three months last year on account of small-pox. There was no mortality to speak of among the school children. It is a crowded house; 348 sittings and 380 pupils on the first floor or an average floor-space to each of nearly seven square feet. Two recitation rooms, each seventeen feet square have usually ninety pupils each or three and one-fourth square feet floor-space and thirty-eight and one-half cubic feet per head. The stairs are badly shaped; there are some good ventilating flues. There are five rooms on the first floor with glass partitions, of these, three have no wardrobes and two have each a closet four feet square.

Tenth Ward School No. 1 is nearly like that in the seventh ward. The main study-room is entered directly from a wooden stair-room which forms a kind of postscript to the house, one such stands at each front corner, and they are as dark and steep as in the seventh ward. Stove heat seventy-eight degrees in both stories. Four tin ducts (3 x 15 feet) for ventilation draw tolerably well; dependence chiefly on windows. The house is about as dark as the preceding; it has no cellar but a sub-floor space; it has no garret, and the ceiling of the second story is plastered on to the roof timbers. The yard is very muddy in rainy weather; when seen there were large puddles, one of which ran over the floor of the girls' privy. Both of the privies were sad sights, but the boys' especially so, with broken roofs, and walls built of bare boards without an attempt to fit joints, like an average country hog-pen; one hole for door and another for window; seats as inconvenient as possible. The attendance in the first story is two hundred and ten, (average) number of sittings one hundred and eighty; floor-space per head eight square feet; primary grade, second story, one recitation-room six and two-fifths square feet floor-space per head; children ten years old.

No. 2, Tenth Ward, is on very sloping ground (slate rock crops out) on the bluff. It was built in 1876. The lot is long and narrow. Of three stories two only are in use; one with two hundred and two, and the other with one hundred and forty-five in attendance.

There was plenty of light from twelve side windows in each room. The third story has tin flues in party-walls drawing well. The first and second stories have brick flues in outer wall drawing well in first story, not at all in second. The privies have vaults which were thought to be tight, but that is doubtful; they are nearly on a level with the second story, owing to the rise of ground, and about twenty feet distant. When the house was built a well was dug just in the rear which furnishes an abundant supply of water. The latter, however, soon became impure, owing to the neighborhood of the vaults, as was thought; it was discontinued, but the adjoining end of the cellar still receives a large inflow from some spring (at x on plan), which has to be carried off by a tile drain.

The following diagram shows the relation of the privies to the well and house.



SCHOOL NO. 2, TENTH WARD, TROY.

(X water enters house by spring.)

Eleventh Ward School. This is not so crowded as some. There are two hundred and thirty-four sittings; one hundred and seventy pupils on the first floor. The recitation-rooms averaged six or six and one-half square feet floor-space per head; others more. Clothes are mostly hung in the large rooms. The stairs are narrow and winding; rather insufficient. The temperature ranges from seventy-three degrees to eighty-one degrees Fahrenheit. The ventilation flues used are nearly worthless; a disused chimney has not been applied as it might be with profit. The floors and wood-work are old and worn. The privy vault receives waste from water-taps in the house, which have traps beneath; it is professedly tight, and is washed out twice a week with a hydrant into a sewer.

Thirteenth Ward School, seen after hours. Average attendance six hundred. A recitation-room, eighteen by eighteen, averages seventy or eighty primary children — a trifle over four square feet floor space per head. Height, twelve feet. The stairs are badly curved. The house was found close even after school hours. There were only fifteen seats in the privies.

PUBLIC SCHOOLS OF LANSINGBURG.

The town contains four two-story brick school-houses with a total registered attendance of 950, and a seating capacity of 1025. All are in good repair and keeping. One of the lots is liberal in size. Overcrowding does not exist in any excessive degree. One school has sufficient space. The houses and inmates are cleanly; the clothes-room sufficient; a roller towel hangs in each school. One house uses filtered rain water and one has a driven well in the cellar; the others use pumps.

The plan of these schools retain the feature of one large study-room. In two of them, however, a former large room has been divided by a partition, making two good class-rooms. The new school has simply four equal sized class-rooms, without recitation-rooms. The stairs are solidly built, with one turn and a wooden partition instead of well and rail. Vaccination is not enforced. Children from the house where contagious diseases are known to exist are excluded; but for information in regard to such cases, teachers rely on their own exertions, without assistance from the Board of Health. Very commendable efforts are making to improve the ventilation by window-boards and flues. The privies are fairly clean, but of the old-fashioned sort. The soil is a gravelly loam, pervious to water; and the propriety of retaining privies is distinctly questionable. The privy at the Market street school is altogether too near the house to be safe; a vile odor in one neighboring room of the school is complained of, of undefined origin, perhaps referable to the cellar and soil pollution.

Whipple Street School.—Primary and intermediate grades. Floor space per sitting ten superficial feet in main and recitation-rooms. Lighting not quite perfect; glass about $\frac{10}{17}$ of floor-space and trees in the way. There are four flues of brick which are capped with tin tips and the Globe ventilator. They draw pretty well from the first

story, but the air passes through them at more than one place from the first to the second story. (A match lighted at a lower orifice was distinctly smelt at the inlet in the story above, in two of the flues.) The ventilation is complained of as poor.

Market Street School was built in 1847 and has since been altered. It has four large rooms on the first floor, with space per head of 12, 12, 11, 12.6 square feet respectively, on the basis of seating capacity. On the second floor 72 pupils averaging nearly fifteen years of age giving less than 9 square feet to each pupil in attendance. There are tin ventilator pipes, of the combined sectional area of 500 square inches acting well (some of them remarkably so.) They go straight to the roof and have simple caps. The worst ventilated room is one with flues discharging into a garret, with a cap on the ridge-pole. There are well-founded complaints of bad air in the school.

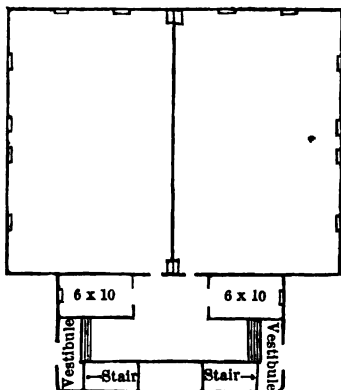
Fourth Ward School (Primary and Intermediate). The house is ten years old. The main room has 19.4 square feet of floor space per head, on the basis of actual attendance; 12.5 on that of seating capacity. Two recitation-rooms, 12x15 feet each, contain classes of fifteen pupils = 10 square feet each; one room up stairs, 35 small children = 7½ square feet each. Ventilation decidedly bad, — the worst of the schools in that respect; no flues, except two which are nearly closed and discharge air into the unfinished portion of the second story which has a musty smell in consequence.

The Diamond Street School deserves special mention. The lot is liberal in size (120x150 feet) and neatly fenced; the privies 60 feet from the house in different directions. The house-doors (three, leading from one hall) open outwards. The clothes rooms, one to each school-room, measure 6x10 feet and are light and airy. The finish of the hall and the wainscoting of the rooms is in wood. The windows number six in each room, each 8x2½ feet, or, allowing for sash, about 120 square feet of glass in all which equals ⅓ of the floor-space. They are placed so high that there can scarcely be two inches between the frame and the ceiling and this is accomplished without iron girders. The house however is not heavy and has but four rooms. The proportion of the latter are good and the floor-space equals seventeen square feet to each sitting in three primary rooms, and 24 in one intermediate room. This with a height of thirteen feet gives the ample allowance of 221 and 312 cubic feet of space per head to the primary and intermediate grades respectively. The window sills are four feet above the floor, but this does not seem to injure the appearance of the rooms.

The drinking-water is taken from a cistern in the rear of the house which receives and filters the discharge from the metal roof. The school-rooms contain wash-stands for scholars' use. "Those who come with dirty faces are obliged to wash them," and this mild form of punishment is effectual in preventing a repetition of the offense.

Two self-feeding jacket stoves in the cellar (which is a pattern of neatness) with inlets 1x2½ feet in section warm the house. There are two shafts for ventilation, placed between the rooms. Each shaft has three flues; one 12x12 inches for the smoke of the furnace and one on each side of it, each 12x16 inches for ventilation. Thus there are four ventilating shafts with a total sectional area of 1,408 square inches, finished tolerably smooth inside and going clear through the roof. There was a very powerful draft at the inlets in the lower rooms but

the shafts are each tapped twice and the inlets at the upper rooms do not draw so well. The inlets are placed at the floor, are 16 inches square, without valves, and guarded by wide meshed wire netting. The windows are double throughout which furnishes a very safe auxiliary to the ventilation.



Diamond St. School, Lansingburgh, first story.

PUBLIC SCHOOLS OF WEST TROY.

The public schools in this place are not in a promising state. Public interest does not seem to support them. A very large number of children are employed occasionally in market gardening, and the attendance is apt to vary widely from the registration. There are several important private schools; and many children, besides, go across the river to Troy, or to other towns, to school. The buildings, with one exception, are old and rusty; several of them are quite unsuited to their present use, and two, at least, should be abandoned entirely. As a rule, the privy vaults leak freely into the soil; urinals are not provided, and the separation of the sexes is not sufficiently attended to. A case of contagious disease excludes the remaining members of a family from school.

The First Ward has two school-houses. The larger one is of brick, about 12 years old. The scholars are of the poorer class. The rooms are close and poorly lighted, (window-surface 1-12 of floor-surface). The clothes are kept in close, small closets, and in the seats. There is a certain desk which possesses the power of making a startling clatter when its hinge-joints are put in operation. Gymnastics are sometimes practiced "to keep warm." The privy has not been cleaned out for five years. There are 300 enrolled pupils, and an average attendance of 150.

The smaller house has on the first floor 108 little scholars with 82 sittings. They sit all together in a room 27 feet 6 inches wide, 31 feet 2 inches long, 12 feet 6 inches high; the cubic space per head is a trifle under 100 feet; floor-space 8 feet. Ventilation almost impossible without dangerous draughts; the air was very bad; thermometer 77°. Everything in the room (except the inmates) was antiquated and odd. The second story has one rather larger room with 60 older pupils.

"They are allowed to move at once, whenever they feel cold." Open windows keep the room comfortable. The water for both houses is brought from a pump in the road, which must be 130 feet from any privy. The privies are deficient in accommodation, and consist of one house with a board partition; there is no partition in the yard; the children from both houses play in the street at recess for want of room in the yards.

In Ward 2 there are two houses. The primary school-house is an old wooden structure of two stories. The yard is small. The room on the lower floor is 27x23 feet, and only 9 feet high. Before entering the house, the frequent sound of coughing was heard, proceeding from this room. Within, the room was found packed, more than a hundred little creatures about the age of five, heaped together, as it were, evidently coming from the poorest classes. The attendance varies from 100 to 122. The stove was briskly at work; the windows were freely opened, throwing draughts upon every child's head; the teacher said that if this was not done they all had headache. The greater part of the children seemed to have colds. The floor was wet; this was explained to be due to the practice of squeezing out their wet slate-rags on the floor, which is encouraged, "in order to lay the dust." There are no mats or scrapers, and the house is so old that dust is a very probable circumstance concomitant. The cellar is perfectly dry and extends under the whole house. The second story is not quite eight feet high, and averages 56 pupils; a very comfortable room in comparison with the other. The stairway is only 32 inches wide, and the hand-rail makes the space still narrower, say 2 feet and 2 inches wide. House entirely unfit for its present use.

The larger school-house has a muddy, low, undrained yard, without separation of sexes, and a privy in a disgusting state. The stairs are too steep. The air is kept good in the rooms by opening windows.

The Third Ward School is new. The first floor contains two rooms, each 21x43 feet and eleven feet high. The seats and attendance are respectively 76-92; 96-76; showing a discrepancy in both directions. The teachers said that this was unavoidable, owing to the inequality in different classes. Cubic space per head, 106 and 132 feet, respectively. The recitation-room receives classes of from fifteen to forty children giving allowances of from forty-five to one hundred and nineteen cubic feet each. In the rear there is a clothes-closet, or rather two closets with no partition; in each, the boys use one wall and the girls the other to hang their clothes. The yard is divided by a fence, but is muddy; the privy is one house with a board partition. The floors are said to be cleaned once a year. The ventilators work both ways. The cellar is hot and close, and contains great quantities of ashes. A certain part of the cellar floor is occasionally used as a privy of the pre-historic type. The janitor sweeps his dust from the house directly down into the cellar, and keeps it there. At the time of the visit, the air in the house smelt of gas from the furnace.

The Fourth Ward School is in an old brick house, which looks like a barn; and the internal structure does not belie the promise of the outside. The sweeping of the floors is imperfectly attended to twice a week, and the appearance of the room corresponds with that neglect. The desks are very old and badly hacked. The room on the lower

story is ten feet in height, that on the upper story nine feet; the ventilation of the latter is much complained of. The first floor room (25x20 feet) registers ninety, with an attendance of fifty-five or sixty; the second floor room is larger and has an attendance of forty-five or fifty. The house is evidently not popular in the neighborhood. Four large private schools attract a very much greater number of pupils than are found in this. The pump is at the street corner, probably not within fifty feet of a privy.

PUBLIC SCHOOLS OF GREEN ISLAND.

Waterliet District No. 23 ("Green Island"), contains two schools. No. 1 is about twenty-five years old. No. 2 was built last year. A great unwillingness to open the windows is characteristic of the district. No. 1 is heated by three furnaces in the cellar, which draw a considerable part of their air-supply from the cellar. The air entering the room is at 126°, and that in the house is decidedly hot, one room being at 77°, another at 79°. The rooms are rather crowded; two had respectively nine and ten square feet of floor-space per head. Each room has two or three ventilating exits, usually acting well, but much improved when the door was opened.

The plan of No. 2 is very similar to that of No. 1, with broad entries, four rooms to a floor, good clothes-closets in the entries. The house is heated by direct radiation from steam coils. The building was visited at too late an hour for complete inspection.

SCHAGHTICOKE (HART'S FALLS) SCHOOL-HOUSE.

There is much malarial intermittent fever in this place, and many of the children suffer. However, the site of the school-house does not, apparently, contribute to this result; it stands on a steep bluff, very high above the river, and the natural drainage is good. The house is six years old and stands in a large lot, neatly laid out with grass and trees. There are 250 sittings and an average attendance of 165; as is frequent in such cases, the air of the house seemed good. Certainly this was so in the second story, where there were *present* fifty-five pupils in two rooms with a united floor-space of 2,128 square feet—nearly forty square feet apiece, or 538 cubic feet apiece. The *desks* number 126 in this story. The lower story, being much fuller, was rather close. Air passes from each room by one register near the ceiling; the rate is good, but one flue is not enough, and when the house is filled this will be perceived. A clean cellar is used for an evening school. The water comes from a well, quite remote from privies. The house is a good one, but the recitation-rooms are quite small (16x19 1-2 feet) and unventilated.

HOOSICK FALLS SCHOOL-HOUSES.

The hours of school are nine to twelve A. M., and quarter past one to half past three P. M. Primary scholars are dismissed at half-past two. There is a recess in the forenoon, but none in the afternoon; the omission seems to be considered a gain in respect to discipline, and does not deprive a child of the right to leave the room when necessary. The primary and intermediate grades practice gymnastics five minutes, both forenoon and afternoon.

Half-time was tried last year for twelve weeks with a class of 100 children in the lowest grade. A single teacher instructed one-half of the class in the forenoon, and the other half in the afternoon, giving three hours to each half. The progress equalled that which is usual.

Three buildings were visited.

The Academy is a two-story brick house on high ground, with a steep rise in the rear. In each floor three rooms belong to the old part and two new rooms project as wings. The latter stand free on three sides, and have shafts with rather powerful exit-currents on two sides; they may be considered as satisfactory. In the old rooms there was a general closeness, occasional excessive heat, some defective lighting, and some crowding. One room had fifty-six pupils (all present!) of the age of ten years, upon a space measuring 13 1-2 x 39 feet. The cubic space per head is eighty-nine feet; it is almost impossible to ventilate the room and the heat is excessive, but in the want of a thermometer in the building, 82° was guessed. The room is 9 1-2 feet high.

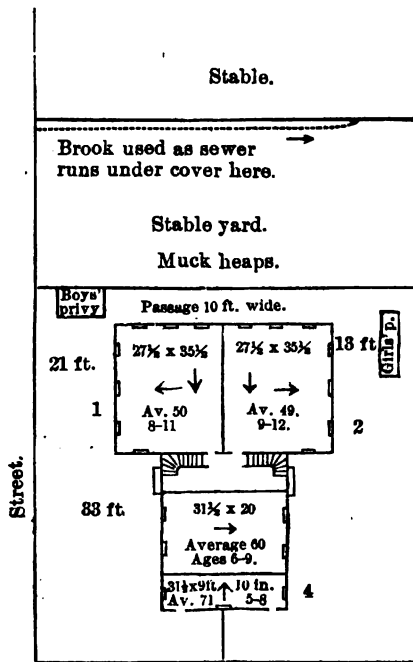
In two other rooms the cubic space was 77 and 110; ages of pupils, about twelve and eleven, respectively. The privy contains no seats; its floor was filthy, and so was that of the other school-house, also. A pump in the cellar supplies drinking-water.

The new school has two floors and two rooms on each. The most crowded room allows about 160 cubic feet per desk; the house is not full. In one room, certainly, the light is insufficient; for two out of seven of the windows are in front of the pupils, so that the blinds have to be closed, and the remaining five equal only 1-14 of the floor-space, and are too far from the ceilings. There are five ventilating holes in each room, which do not act; they are circular, eight inches in diameter, communicate with spaces in partitions, and all discharge ultimately into two brick flues, each one foot square, which constitute the exits for the entire house, with about 250 inmates. The water-closets were originally placed in two small contiguous chambers in the cellar, containing three pan-closets each, which were reached by one stairway through a very dark cellar. The boys' closet, however, had to be abandoned on account of the smell, and a wooden privy was built, forty feet from the house, with seats quite too high. The yard is not divided.

Two rooms are hired for school uses in a business block, upstairs. The rooms themselves are not objectionable, but there is no place for play outside.

PUBLIC SCHOOLS OF PEEKSKILL.

The village of Peekskill contains two school-houses of nearly equal size.



[Plan of Union School premises.]

The Union School-house. The site is low, as regards surrounding grounds, and difficult to drain. Water often stands in the cellar. The lot is one hundred feet square; one-half of all the open grounds is fenced for the girls; the other half is without fence, and is muddy. The adjacent ground, eastward, is a stable-yard, with heaps of manure near the school-grounds; a little brook runs under the further edge of the stable-yard; it receives the sewage of a group of houses, and is often stagnant and offensive in summer. The stable is only fifty-five feet from the school-house. There are two privies; that for the girls is thirteen feet from the house; is old, and smells badly. That for the boys is about three feet from the house, and its seats are unsuitable; the floor was found clean (it was an "exhibition day"), but there was information that the usual state is far otherwise. It has only recently been removed from the spot marked ooo on the diagram, where the side of the school-house actually formed one of its four walls. Each privy has five seats, giving about a third of the accommodations needed by an average attendance of three hundred and thirty-two (enrolled, 430).

The school-house is of wood, two stories high; the first story nine feet nine inches to the ceiling, the second, twelve feet. It is about thirty or forty years old, and is in appearance an average back-country district school-

house, magnified in dimensions. There are a good many large windows, and in most of the rooms the light is tolerable, or sufficient; but where the children face the windows (as in the master's room, No. 1 up-stairs), blinds have to be closed, and a deficiency exists. The interior is old and worn; new floors and some new furniture are desirable. The floor of room No. 1 was very dirty and neglected. The mud is brought in by the children after playing in the yard and streets.

The ratio of density of this school population, is given in the following table:

Story.	Room.	Number of pupils.	Ages.	Floor, sq. feet.	Room, cub. feet.	Floor-space per scholar.	Cubic space per scholar.
2	1	15	14-17	957	11,484	63.8	765.6
	2	40	10	957	11,484	23.9	286.8
	3	25	10	465	5,580	18.6	223.2
	4	42	15	465	5,580	11.0	132.0
1	1	50	8-11	957	9,331	19.0	186.0
	2	49	9-12	957	9,331	19.5	190.0
	3	60	6-9	624	6,984	10.4	101.4
	4	71	5-8	306	2,983	4.3	42.0

The disproportion is enormous between the amount of space allowed for the different classes. The room which stands at the foot of the list is far the worst. It was formerly a lumber-room, and has been converted to its present use very recently. The attendance in this room varies from 35 to 80. It is simply impossible to ventilate it properly without causing dangerous draughts. Nothing in the way of assisting ventilation is done in the entire house, except by opening windows; and they were found open here also. The room is less than ten feet high, and less than ten feet wide; draughts and colds are prevalent, and the visitors found, as it seemed, one-half of the children coughing or sneezing.

There are four stoves on the first floor. One is a small one, for the sole use of the room just mentioned. The others stand in the other rooms, each provided with a jacket for the purpose of collecting the foul air from said rooms and sending it up through a pipe to warm the rooms on the second floor, which have no other means of heating. In one of these upper rooms the teacher said the children suffered much from headache.

Upon a rough estimate, nearly twice the present number of children under sixteen require accommodations in the public school of this district. A new house is urgently required under the present circumstances, which are most obviously imperiling the children—at one end by over-crowding and cold draughts, at the other end by stench and soil-pollution, and in all parts by dampness of site and foul air within the house.

Drum Hill School-house enjoys one of the most charming views to be had in the region of the Hudson river. It stands on a high rocky elevation, far above the village. The number of pupils is about the same as in the other house, but their lot is a more agreeable one. It is of brick, two stories in height. A large addition is now making, inclusive

of a widening of the hall and staircases. The lower story in the older portion measures 63 feet 8 inches by 22 feet 8 inches within walls, and is divided telescope-wise into three rooms, containing 200 pupils. The freedom of circulation of air, due to the elevated site, and the comparatively open (non-compact) plan of the house, aid much in securing good ventilation, for which no sufficient provision is made in construction.

YONKERS CITY SCHOOLS.

In this city the two large and one of the three smaller houses were visited.

School-house No. 2 is of brick with three stories and a cellar. The land is 100 feet above tide-water at the middle point of the school, and slopes so rapidly that there is an exit directly to the ground from each story. The space is ample; the soil rocky, in part covered with gravel.

The main building contains 21 rooms, 925 sittings, 117,788 cubic feet of space in study-rooms, and a total average of 127 cubic feet per sitting. The primary rooms, as usual, were the fullest, four such having about 9 square feet apiece of floor-space per sitting. An epidemic of measles had drawn off about 400 of the scholars, and the "annex" (two rooms in a neighboring wooden house) had been closed.

One primary room has about 3 3-4 square feet floor-space per head, viz.: 104 seats and 384 square feet floor (24x16). This room is dark, and when the school is at a normal standard, extremely crowded and close.

Six rooms besides the last named have defective light, the window-space being from 1-8 to 1-9 the floor-space. There is no general attention to the principles of lighting. The house has no blinds, cloth roller shades being used in some south rooms. The desks are not ideal, but a graduation (three sizes to a room) is to be commended, and also a correct distancing of seats from desks. There is an abundance of places to drink and wash, and one room (20x40) with good light, warmth and cement floor for the girls to remain in and eat a noon-day lunch. The cellar is good and dry; it contains four furnaces. There are three jacketed furnaces and one base burner in the second story. The clothes are hung in the entries. The privies are in good order, no sewerage, simple cemented vaults, distance 35 feet from house. It is desirable to substitute some other arrangement.

The house has nine outlets, all by doors opening outwardly. Two short corridors run across the whole width; one long one nearly the whole length. The circulation of air is probably facilitated by this arrangement. In most of the rooms the atmosphere was fairly good. Windows were freely used, however, and doors and transoms were all open to corridors. The outside temperature was 37° F.

The ventilator register in the west rooms (four in each room each 8'x12') open into hollow walls and the air is presumed to discharge into the attic. From the latter three pipes, eight and one-half feet in circumference, open upwards into the open air. The current in many of the above registers was not good. The chief complaint in regard to ventilation in this house proceeded from certain rooms which are rather long and narrow (17'x27') with only two windows placed opposite the door so as to be most remote from it. In the rooms which had no flues this complaint was not heard; these rooms are surrounded on three

sides by corridors and the fourth side has four windows. The singing of the school in common and the teaching of music and reading deserve very favorable mention.

The "Annex" consisting of two rooms in a wooden house near by of the dimensions of 38' x 18' floor and 7½' and 8' respectively in height. Cubic contents of first 5130; pupils (1 primary) 50; seats of second, 5470; pupils (K primary) 90; seats, 94. The floor-space is accordingly 12.7 and 7.3 feet apiece, cubic space 95 and 57 feet apiece in the two rooms, respectively. The low ceilings, defective light, and absence of ventilation combine to make these rooms undesirable especially for such close crowding.

No. 6 registers 621 pupils in eighteen class-rooms. The site resembles that of No. 2. In respect to size of rooms, floor-space per head of actual attendance, opening of windows and doors, size of ventilator flues and registers, No. 6 has a little the advantage or is not inferior to No. 2. The house is heated by six boilers (steam) the coils being placed in the cellar under the points where heated air is to be distributed to rooms. The air of the house was found generally inferior to that of No. 2. Perhaps the side of the corridors may be an important element in this result there being but one in No. 6 and that closed by double doors at each end.

In two crowded rooms formerly noted for poor air, a tin pipe open at floor and ceiling, heated by two Argand burners and carried far above the roof, seemed to act successfully. The comparative purity of the air was at once noticeable. It is said that the tube receives 900 cubic feet of air per minute from each room. The windows and doors were closed for twenty-five minutes without greatly increasing heat or closeness.

The cellar is under-run by the house sewer which starts at the water-closets situate at one end of the building in a porch. These closets and their surroundings are highly commendable. A little freer access to the places under the seats and a little less wood work might be desirable; also some readier way of disposing of water used in swabbing down than that of pushing it out into the yard with a swab. As a change from the old arrangement of water-closets under the house the new is every way desirable.

The house is dry the cellar being properly under-drained.

The children's clothes are kept in named closets in the school-rooms as in the New York schools.

Union Free School No. 1 has one class-room and about fifty scholars. Above it is a similar room for public performances. It has a good roomy vestibule, a large library room, two good stairs, a model cellar with good hot-air furnace, cistern for drinking. The class-room is spacious and high and prettily decorated. Unfortunately it must be added that the site is low and in the centre of a malarious region though there is no dampness about the house and no cases of fever can be traced to its influence and also that the cost of erecting was \$9,000.

The city has an ordinance passed in 1877-78, requiring every practicing physician and surgeon under penalty of fine to report to the Board of Health the cases of contagious diseases occurring in his practice. Much opposition was made to the passage of the law. The reported

cases, however, are not brought directly to the notice of the school authorities as they should be. Cases of such disease, and all children residing on the same floor with cases are alike excluded from school, until a certificate of fitness to return to school is given by the physician. The fact of vaccination is recorded on the school register.

PUBLIC SCHOOLS OF NEW ROCHELLE VILLAGE.

At this place there is one large brick school-house with five hundred and fifty-one registered pupils, and two smaller schools of one room each, which present nothing of special interest.

The large school occupies a very beautiful site—two acres of land falling rather rapidly in the rear, embellished with fine trees, seats, and a flower garden. The premises seemed to be under the protection of the scholars.

The house is about twenty years old, and has faults in its plan. A newer portion has imitated the style of the older. It is somewhat crowded. There are eleven rooms, one for each grade, and one large assembly room. Of the class-rooms, one has twenty square feet of floor-space per pupil. The others have from 6.7 to thirteen, with an average actual attendance of forty-four to each room. The rooms are of the height of eleven and three quarters feet, and twelve feet. The light is deficient in some rooms, and badly distributed in others. There are four in which the windows are twenty-four feet from the opposite wall (and on one side only). The ratio of glass to floor-surface is one-thirteenth, and they are justly complained of as dark—two of them also as close.

There is no ventilation except by opening windows; in cold weather window boards are placed under the sash. The house is heated by three furnaces in the story which may be called either cellar or basement, a story which is uncovered by the slope of the land in the rear. The youngest class of children still occupies one room in this story; a sub-floor space under this room is the source of supply of fresh air to a jacketed furnace which warms this room, and the two above it. No complaint of dampness was made. There are good sized play-rooms in this story; it is about eight and one-half feet high, and not wholly satisfactory as a plan for school work.

One stair is very good, the other one (frequently used and liable to be used in an emergency), is only two feet wide, and has sharp turns; it can hardly be approved. The doors of exit from the house open outward and are sufficient.

Light gymnastics are confined to the primary grades, once a day in the higher, twice in the lower. The school is neatly kept and orderly. The drinking water is from pumps near the house, one hundred and forty feet from the privies, and in all probability uncontaminated. The privies are about forty, eighty and one hundred feet from the house. They are properly cleaned, but the vaults are offensive; one of them has not been cleaned out for three or four years. A board fence cuts the play-ground in two.

Respectfully submitted,
JAMES G. HUNT, M. D.,
Chairman of Committee.

NOTES AND CONCLUSIONS

UPON THE RESULTS OF THE INSPECTION OF SCHOOL-HOUSES UNDER THE COMMITTEE ON PUBLIC INSTITUTIONS, AND UPON DR. LINCOLN'S REPORT ON THE PRINCIPLES AND PRACTICE OF SCHOOL HYGIENE.

The results of personal inspection are found to harmonize quite generally with the replies which have been sent in by school district officers relating to the health questions submitted by this Board in circular No. 35. These results of the inquiry, by means of the circular to school officers, are yet incomplete. They will be studied advantageously at the expiration of another year; for over 11,400 school districts in the rural parts of the State are day by day making their returns upon the questions of that circular.*

The conclusions reached by the committee, and by Dr. Lincoln who labored with it for a period of three months, are briefly summarized as follows:

1. Structural improvements are being made in the school-houses in many districts; there is a recognized attention to some of the requirements of health that have been neglected in the old school-houses.

2. The committee has found only about one in fifteen of the common school-houses well outfitted for protecting the health of the pupils. Even in that one, there is oftener a neglect of sufficient ventilation than a suitable provision for it.

3. As a general fact, ventilation in the common school-houses is insufficient, and the means for it badly designed. When good, its excellence depends chiefly upon open windows and special facilities for controlling them.

4. Over-crowding is a prevailing fault, and even a wrong, in a majority of the school-houses which the committee and Dr. Lincoln have reported upon. The exceptions to this rule are noticeable in some of the diagrams printed in the report. In many of the schools the over-crowding is such as to endanger the health and life of the children, and taken in connection with defective ventilation, is a matter of momentous importance to the most loved and valued of lives in the families that send their children to the common schools.

* The preceding report by the Standing Committee on Public Institutions, presents notes and illustrations from that committee's inspections.

5. In numerous towns, villages and cities, as shown in the report, there is a disgusting, degrading and harmful neglect of sanitary cleanliness in and about the school buildings, especially as regards the privies and the means for the proper separateness and convenience of the sexes in relation to these matters.

Such neglect of cleanliness and decency should be interfered with and prevented by local sanitary authority. The public health, the bodily welfare of the children, and their moral safety alike require that this duty shall be attended to promptly, and by peremptory orders wherever necessary.

7. The supply of drinking water for the common school children is much neglected, excepting where hydrants, from the public water service, exist upon the premises.

8. Wardrobes or rooms, with pegs or brackets upon which to suspend outer garments and wet clothing, are seldom found suitably placed, and often they are neglected altogether.

9. Hand-basing, wash-stands or lavatories are wanting in a great proportion of the common school-houses.

10. The experiment of omitting the old practice of school recesses between the noon hour and the opening and closing of school, is being extensively adopted with doubtful — probably injurious — results.

11. The recreations needed by school children, under the name of light gymnastics or play, are confessed to be of great use to the younger classes in the common schools; but it is found that the people do not suitably appreciate such physical exercises. It is desired, therefore, that teachers and parents should more thoroughly understand the reasons for encouraging and perfecting facilities for them.

12. There is found to be special reason for urging that girls shall not be deprived of the means of health which innocent and regulated gymnastics afford.

13. There is much neglect of, yet an increasing attention to, school seats and desks. This subject is found to need even greater attention than it is receiving.

14. The permanent injury to the eye-sight of school children is so frequent, and yet so preventable, that the known causes of such harm should be ascertained and provided against in every school. The proper lighting of the school-rooms, the best adjustment of seats, desks and black-boards, and the necessary regulations of study and exercise should be secured under competent medical advice, in which in every new or remodelled school-house the most approved lighting and the best arrangement of seats, desks, etc., for the protection of eye-sight, and for the general welfare of the pupils, should be provided.

15. The reception of vaccination by school children, under direction

of their parents and the school officers, is found to have nowhere produced inconvenience or serious dissatisfaction. It seems eminently desirable, and certainly practicable, to secure general compliance with the statutes relating to the vaccination of school children as now administered under advice of the State Board of Health. (See circulars Nos. 17, 38 and 41.)

16. There is an obvious necessity for the promulgation and adoption of sanitary rules and regulations for the protection of health and life in schools as now recommended by the Board. (See circular No. 41.)

DR. LINCOLN'S REPORT ON THE PRINCIPLES AND PRACTICE OF SCHOOL OF HYGIENE.

As the Board has, for many months past, found it necessary to have at hand ready replies to practical questions which arise in almost every school district, and especially where there are outbreaks of contagious diseases, overcrowding of schools, high death-rates in particular schools, or new questions that have to be discussed and settled where school buildings are to be constructed or improved, this Board has directed that Dr. Lincoln's special report shall be added to the foregoing conclusions in order to supply such information as is herein given with ample illustrations and examples.

In offering the foregoing conclusions, together with the special report of Dr. David F. Lincoln, relating to Sanitary Requirements in the Common School-houses of the State, this Board, at its quarterly meeting on the 8th of February, made the following minute of its reasons and order for reprinting and separately distributing this part of its Second Annual Report:

"WHEREAS, School officers of numerous districts in the State have applied to the State Board of Health for suggestions concerning the proper sanitary arrangements for school-houses, therefore,

"*Resolved*, That the conclusions derived from the report of the Standing Committee on Public Institutions, as regards school hygiene, together with the recommendations in Dr. Lincoln's special report on the subject, are hereby adopted by this Board and ordered to be reprinted from the Annual Report, for distribution to School Commissioners and the proper School Officers."

This document will be known as No. 43 in the series of the Board's publications, and it is earnestly commended to the attention of the people, who have upwards of a million of their children in attendance in the common schools of the State.

EDWARD M. MOORE, M. D.,
President.

ELISHA HARRIS, M. D.,
Secretary.

LIST OF ILLUSTRATIONS.

	PAGE.
1. Converging ventilation flues, hooded, etc.....	194
2. Hooded exit shafts (direct to, and above, roof).....	195
3. Stove and jacket, showing the fresh-air shaft-areas	196
4. Exits for foul air by stove-pipes and their jackets.....	197
5. Do do do do	197
6. Do do do do	198
7. Fresh-air inlets	201
8. Fresh-air inlets and ceiling exit	202
9 and 10. Rooms for imperceptible ventilation.....	203
11. An example in a Rochester school-room	203
12. A specimen of unventilated, overcrowded and poorly lighted school-rooms	204
13. The Yonkers examples of ventilation, etc.....	205
14 and 15. Special examples in the city of Troy	206
16 and 17. Examples of ventilation and lighting in the Court street and in the Francis street schools, Utica	207-208
18. Example in Rochester, school No. 13.....	211
19 and 20. Other examples in Rochester	212
21 and 22. Faultiness in sliding glass doors, illustrated.....	212-213
23 and 24. Illustrations of the treatment of windows in reference to suitable lighting... ..	213-214
25. Illustration of the distribution of light to central desks and seats.....	214
26. Illustrations of lighting in the Hoosick Falls public schools..	214
27. Studies in the lighting and ventilation of public school No. 10, Rochester.....	215
28. Illustration of four school-rooms on one floor, arranged in the four corners, the corridors and accessory rooms being all central	216
29 and 30. Black-boards and the lighting of class-rooms.....	217
31, 32, 33 and 34. Examples in the Union School of Schenectady,	218
35, 36 and 37. Examples in lighting and ventilation in the Brock- port Normal School	218
38, 39, 40 and 41. Examples of faulty lighting in certain public schools of Rochester, Troy and Brockport	219-220
42. Example in one of the Albany public schools	221

REPORT UPON SCHOOL HYGIENE.

BY D. F. LINCOLN, M. D.

NOTE.—During the course of the inspections which have been made under the direction of the State Board of Health, the writer of these pages has had opportunity to observe the actual condition of the school buildings in many widely distant places in the State of New York. The present paper is based chiefly upon these observations, and is intended to supplement the detailed accounts given in the Standing Committee's report, by adding a statement of general principles, adapted to induce the correction of existing defects.

INTRODUCTORY.

A human being, considered by itself, is a unit, and has value as such. In combination with others, it forms a part of a compound unit, a larger being, different from any of the individuals composing it, and endowed with special productive or destructive powers. But every thing has its price; and the gain is associated with a loss. The man who forms part of an association gives up some of his own individual rights. Tied to a machine, he becomes a part of it. Does the child lose any thing by being incorporated in the system of common schools? Doubtless he does.

A child who enters a public school is conscious of a change in his surroundings of which he cannot give an account, but which constitutes for him a new world. He has ceased to be an individual, and has become a fractional part of a machine. He has been well understood by persons who have watched him from his birth, and who are deeply interested in his person. He is now transferred to the care of strangers, who meet with him only five hours in the day, and whose interest in him is restricted by the fact that he forms but a fraction—say from one and one-tenth to two and one-half per cent—of the total group of children that is intrusted to the care of a teacher. He is held by the teacher a few months, and then passed on to another, again as a

fraction, not as an integer.* Does he not lose much, as well as gain something, in this system?

As regards his health, he loses that defence which the sympathy of the community always extends to an individual who is suffering conspicuously. Taken generally, all children in school are suffering some discomfort. Average the discomfort among ten thousand, and it may not be very great for each one. But a class of fifty children is not made up of fifty *averages*. Let us imagine such a class, containing among its members representatives of the common affections of school life, such affections and complaints as the writer of these lines has frequently had to encounter among the children in public schools. Individual number one has a ravenous appetite, sleeps soundly, works little, plays much. Number two is a little pale, eats less in term-time but recovers his appetite each vacation. Number three is detained at home occasionally for headaches, caused by poisonous carbonic oxide and carbonic acid gas, from the stove, or by the foul air of the crowd. Number four mutters arithmetic in his sleep, especially just before the annual examinations for promotion. Number five occasionally sits in a draught of cold air, and catches cold; while his next companion has a tendency to catarrh of the ear, and is gradually becoming deaf under the discipline of a school which confines him to one spot. Number nine is a child whose parents are near-sighted; he sits in a corner of a dark room, where light is insufficient, for writing in the winter season; he is allowed to sit in an attitude that brings his eyes within three inches of the book, and he is placed in a desk which is so high and ill-adapted as to prevent him from holding the object at a proper distance. He is complained of as dull, listless, inattentive to what is written on the board, when in reality he is shut in upon himself by the fact of near-sightedness, which condition is aggravated every day by the way his education is carried on. Number twenty has just recovered from the measles, or perhaps we should rather say, is convalescing — for she is a little pale and weak, her eyes are not strong, and her eager nervousness hints at the reason for her premature return to study; she wants to be present at an examination, on which her “promotion” will depend.

Numbers thirty and forty-one wear glasses; one pair has been placed on the child's eyes by the most accomplished medical skill, for the relief of far-sight; the other has been picked up from a tramping pedler.

Now the classes are ordered to write. They begin in form; but in three minutes' time their heads are bent within an average distance of

*It would be very unjust to many faithful teachers to present this as the universal fact. There are many exceptions, local and personal; but the general tendency remains as stated.

three inches from the copy-books; and a distorted position of the body is inevitably produced by, the faulty shape of the desks. These scholars, the teacher says, write about twenty minutes a day, and that cannot be long enough to inflict any permanent injury. But in another room they are adopting the "Quincy method," and the scholars write a good deal more; and in the upper classes they write long translations and compositions, and copy out lectures.

In another room may be seen a class of girls and boys of about fifteen or sixteen. They pass in file, and there is opportunity for seeing that not one in ten of the girls has an erect figure; many stoop painfully, and among forty whom the eye reaches, four or five appear to be deformed with lateral curvature of the spine. Here is a tall young woman, who sits, like others, with the upper part of her body across the desk in an attitude of fatigue. She is an overworked person, and the school is not wholly to blame for that. But the school may be responsible for the ill-shape of the back of her chair, which gives her no real support in sitting, and compels her to lean forward instead, to relieve a pain in her back.

Such facts as these will constantly meet the eye of one who visits our common schools and studies the health of their inmates. And is there not an inference from such facts? Are they, perhaps, of that class which imply a duty and a responsibility? Human life is the best of human possessions; and the best part of life is the hope that we are leaving behind us those who will be more able and worthy to enjoy it than we have been. These successors of ours are the children. Can any thing touch us more closely than the thought that there is a group of influences, manifold and wide-spread, which are constantly acting to lessen the worth of their young life?

This is a complex field of study, for it includes at one end the details of certain branches of physics and engineering, and extends on the other to questions regarding the powers of young minds, the means of developing without straining them, and the precautions against injury to the highest of the senses. However tempting this field, it is necessary here to limit our scope to the principles and details of what may be called "sanitation" in the most limited sense of the term. In other words, to attempt an answer to certain questions which are most frequently and properly addressed to a board of health, considered as a sanitary counsellor of the people. Such questions belong under the general headings of ventilating and heating; lighting, and the care of eye-sight; planning of school-houses; school desks and seats, and other topics which cannot be fully dwelt upon here.

This paper is meant to be of use to those most concerned with the details of daily school life, with whom the writer has been in frequent contact, and to whom he is happy to acknowledge an indebtedness for many valuable suggestions.

VENTILATION AND HEATING.

"How much?" and "How?" are the two great questions in ventilation.

Ventilation implies getting bad air out and pure air in. How much good air does one person need? Enough is needed so that a person coming in from the fresh air shall not notice closeness, or a smell of closeness. In a house permanently dwelt in, sixty cubic feet per minute, for each person; in a house occupied for short times and then aired out by sweeping draughts, thirty cubic feet per minute, or half a foot per second.*

If we wish to ascertain by calculation how much the ventilating arrangements of a given room are actually supplying, we had better limit the question at first to the point, how much air is *drawn out* or makes exit in each minute or second of time? Evidently, for each cubic foot of air taken out another foot must come in. It will be right to ask afterward whence the new supply comes, and what its degree of purity is. But in our climate rooms cannot be ventilated without flues, and if the flues are adequate to their duty all the air that leaves the room will leave through them. If the flues are weak and insufficient we may find, even in winter, that hot air will go out at an open window; but if they are large and powerful, we can open windows so that the air will come in forcibly.

Few people are aware how small a quantity of air is actually drawn out of apartments by ordinary flues for ventilation. By "ordinary" I mean the old-fashioned sort, of the size of one or two bricks, 4x8 inches, or something about that, with a close grating called a register to obstruct the current at the bottom, a sharp angle at the foot, the inside roughened by protruding mortar and with only an accidental opportunity of getting warmed by contact with a smoke-stack. You stand

The amount of fresh air required is the amount which is needed in order to dilute the impure air to a certain standard of relative purity. All good air contains a small proportion (4-10000) of carbonic acid gas; when human breath is added, the amount is increased. It is found by experience that when this increase brings the total amount to beyond 6-10000, the air begins to smell close. A person may, therefore, add two parts of carbonic acid to 10,000 of air before it becomes objectionable. If he should breathe out two feet of the poisonous gas in an hour he would affect 10,000 feet of air to this extent; but as the real amount expired in an hour is about one-third of two feet, he uses and renders unfit for use one-third of 10,000 feet, or (more exactly) 8,500 cubic feet of fresh air per hour.

in front of it with a light pocket handkerchief; the cloth is gently drawn toward the opening; it deviates a couple of inches; you say "it draws," and are satisfied. "The thing is working." Probably, in such a case, the rate at which the current moves is something like a foot per second. The flue is drawing out a quarter or a half of a cubic foot of air per second — enough, perhaps, for *one person's* requirements. A large schoolroom may often be seen provided with half a dozen or more of just such ventilating flues, which are considered to be "the correct thing," and are pointed out to the visitor as the evidence of good ventilation in the house. Evidently the question of "How much?" is of leading importance in some other matters than those of finance and trade.

It is strongly to be recommended that school authorities should take steps for ascertaining the real working capacity of the flues in the school-houses, for the degree of deficiency can never be known in any other way. The anemometer will give a pretty faithful statement of the current actually passing the flues. Analysis for carbonic acid in the air of the room will give an excellent test. Nor ought we to pass without mention the useful but too often uneducated sense of smell; it furnishes data which make the foundation of all our mathematical calculations, and is by itself a faithful guide for a short time.

A ventilating flue must draw, or it is worthless. This quality, which forms its sole merit, is aided by several other points.

1. It should be as straight as possible from beginning to end. Curves and angles are very great obstructions.

2. It should not, as a rule, be horizontal, or descending in any part. There are special exceptions to be noted hereafter.

3. It should be continuous from the beginning to where it discharges out of doors. A flue that ends in an attic has less carrying force than one that goes up through the roof. The air comes up with a rush, and is dispersed in the air of the attic; the rush, the momentum, which it brings with it is lost in the space. True, the air will get out by an Emerson ventilator at the ridge-pole, if there is one, but the conditions for successful working are best attained by a continuous column.

A tight box lined with tin may properly be used to collect the flues and discharge their collective contents by an opening, as in Fig. 1.

4. It should be smooth internally. A tin pipe is as good as any, and has the advantage of not parting with heat so quickly as dark or slightly roughened metals will. If a brick flue is used it should be larger than the dimensions named above, and should be plastered smooth inside. The hollow spaces in walls should not be relied on to do the work of flues. The width is very small, and the friction against the bricks or lathing is enormous.

5. It should be so protected as to lose no heat. A tin flue passing through a cold entry should be boxed with wood. It should not have a very great distance to traverse in the open air, if of metal. There is, therefore, a certain advantage in compelling tubes to converge inside of the attic, as in Fig. 1, instead of passing up straight through the roof, as in Fig. 2.

6. It should be so protected that the rain will not beat in or the wind blow down. Certain caps will accomplish this object satisfactorily.

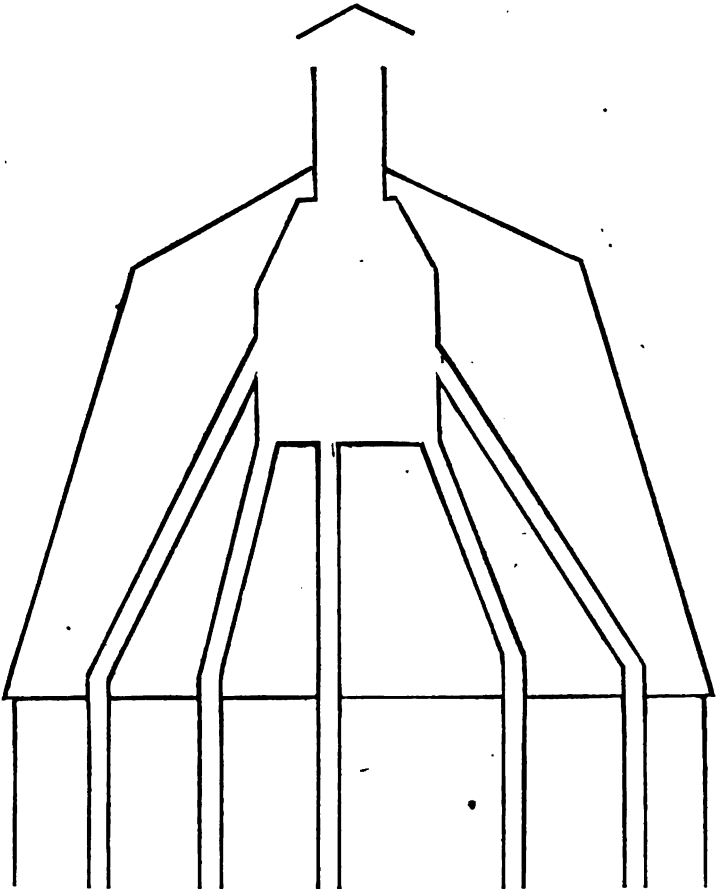


FIG. 1.

There are other caps which increase the upward draught when the wind is blowing upon them, but their action is uncertain, and they may sometimes check the upward current instead of assisting it. The

outlet should not be a narrow one, barely equalling the capacity of the flue, and compelling the current to twist and turn in making its exit.

7. The flue must be devoted to the uses of a single room. If it opens to rooms on successive stories it often serves as a passage from one story to the next above, especially when the flue is not warmed. The heated flue, on the other hand, when drawing from different stories at once, has a much less powerful action upon the upper story.

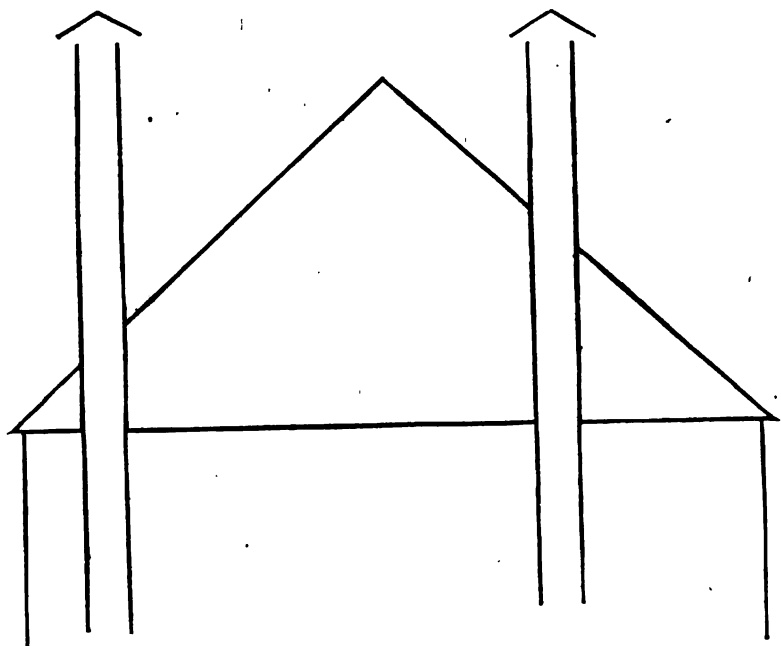


FIG. 2.

8. The flue should be warm; at least it must be as warm or warmer than the outer air, or else the current will be inverted.

Flues ought not to be placed in *outer* walls. Much heat is lost and the opportunity for heating by contact with the chimney is sometimes omitted. An air-space is sometimes employed as a defense. When, for instance, the triangular brick flue is placed in the corner of a room (which is a good arrangement for saving space), the wall should be double on the outside.

The subject of applying warmth to flues is a somewhat extensive one, but a few methods ought to be mentioned.

(a) A brick triple-shaft with the central part devoted to the smoke from the furnace and the two side-flues for ventilators.

(b) A brick-flue heated by a metal-flue (twelve-inch cast iron pipe) divided into sections.

(c) Flues of any kind containing steam pipes or coils.

(d) Steam-coils placed in the chest at ridge-pole (fig. 1). This is not an economical way to apply heat; it affects only the upper few feet of the column of air.

(e) Gas-jets burning behind a pane of glass, which is let into a tin pipe. This is very efficient, yet inexpensive in construction. The efficiency is increased by Gouge's methods.

(f) In a variety of ways the stove or stove pipe can be made useful to expel air from the room.

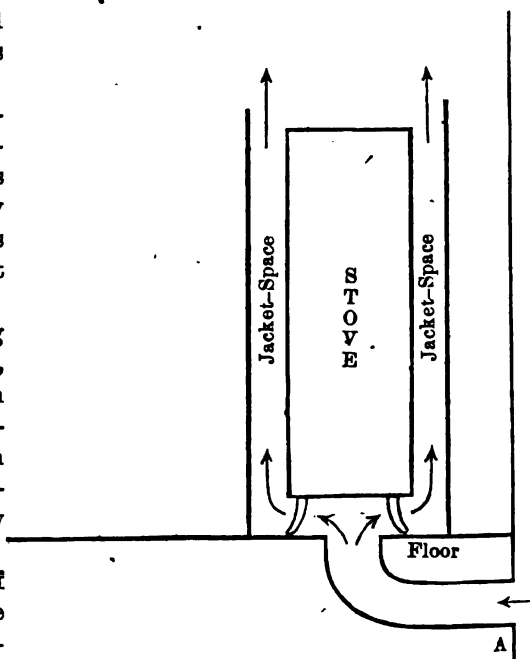


FIG. 3.

The "jacket" or metal screen is a thing of which no stove in an inhabited room should be destitute as a protection from heat. But it is mentioned here as affording an aid to ventilation. Figure 3 shows how this is done. A metal cylinder, considerably wider than the stove, is placed around the latter, and its edge is fastened to the floor. A good sized pipe is then carried through the floor, under the stove, and led through the house-wall at A. Guard the inlet with a screen of wire at A, and a large supply of pure warmed air is drawn into the room. This is one of the cheapest and best devices for warming and ventilating. Some prefer to extend the jacket around only a part of the stove and leave the door uncovered; or the jacket may stop at the bottom of the stove and be made fast to the latter at that point. The arrangement is equivalent to a "portable furnace," such as is usually placed in a cellar or a basement hall.

In figure 4 a stove is represented standing close to an open window. The movable semicylinder of metal, commonly used for a screen, has been so placed as to enclose the stove on all sides except that towards the windows. Cold air may then be freely admitted; it is quickly

warmed by contact with the stove and is thrown upward with the general current.

Figure 5 shows air brought in so as to be warmed by contact with a stove pipe. The inlet flue is enlarged and runs up with the stove pipe, like a jacket, for same distance.

Figure 6 shows how a stove pipe may assist in removing injurious air. The diagram represents a two-story house with a chimney which comes down to only a very short distance from the roof. The opening into the chimney for the stove pipe is enlarged so as to receive a much larger pipe, which encircles the stove pipe like a jacket. This jacket may stop short at A, or may be carried through the floor to B in the first story. It will secure a draught from either story as may be arranged. The idea of this and the preceding figure is borrowed from an article in the report of the Michigan Board of Health for 1879.

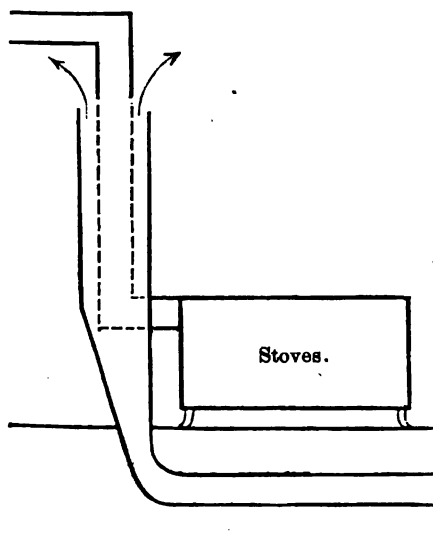


FIG. 5.

making one shaft do the work for the whole house; in which case

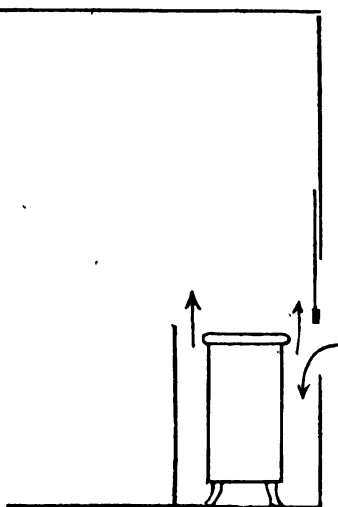


FIG. 4.

A chimney into which a smoke-flue discharges may be opened at any point *below*, and not too near, the point where the smoke enters. Many rooms, for instance, have chimneys which reach to the floor, while the stove pipe enters near the ceiling; such chimneys ought to lend their powers to the task of ventilating the room by an opening near the floor. The latter ought to be closed when the fire is making.

The term "aspiration" is applied to the suctional force of heated flues. The method by aspiration has been used systematically in large school-houses

the room-flues are often made in the floor, running across to the brick shaft. In some cases all the flues are made to descend to the base of the shaft before entering it. A discussion of this matter on a large scale is beyond the purpose of this paper. Where the number of rooms is great, and the exposure to the weather is different in different parts of the building, unequal action is likely to occur.

If the shaft or flue opens into the upper part of a school room, the air drawn out is several degrees hotter than if it opens near the floor. The draught is therefore more powerful. Still, it is best to carry the shaft nearly to the floor, where its effect is to stimulate the circulation of the warmed air

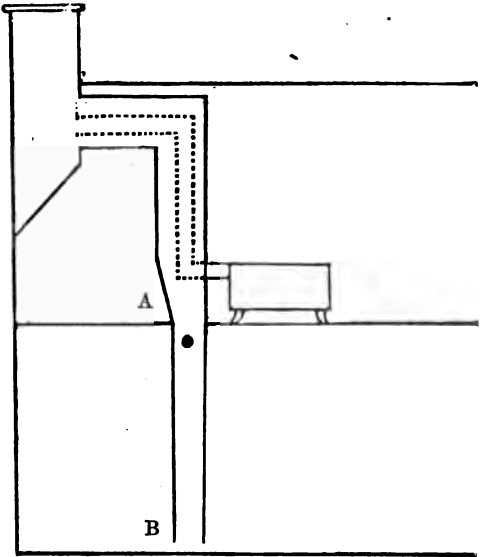


FIG. 6.

in a downward direction, and to increase the heating power of the stove. No draught will usually be felt from it by a person sitting at the distance of four or five feet. We need not be influenced by any theoretical considerations as to the level where carbonic acid is most abundant—there is no great and constant difference between different levels; but we shall not fail to find sources of impurity of air more frequent at or near the floor than higher up. If gas is burning, the case is different.

As regards a heating apparatus, furnaces in cellars are most manageable when standing directly under the rooms they are to heat, or at the windward corner of the house; in other cases they sometimes play strange tricks, refusing to yield warm air, or drawing it out from the room. A steam apparatus has this advantage, that the heat can be placed just where it is needed. Whenever a supply is wanted in a room, a tin pipe (wood should be avoided as unsafe), can be led down from that point to the cellar, and a steam coil put there, encased in a wooden box lined with tin to save heat, which has a value for stormy weather; but in no case should air be taken from cellars for school consumption—certainly not while the school is in session.

There is much carelessness about the source of air which is drawn into furnaces for heating, and sent up into rooms. The ground may,

it is true, be a pure and inoffensive bit of turf, but that is an unusual condition in the school yard. Bad air, malarial air, is known to settle upon the ground in many cases. The ground-level is less reached by the renovating breezes than higher levels. Sundry unpleasant elements in the surroundings of school-houses are at the ground-level. As a rule, openings for drawing the outer air into the house had better be at points above the children's heads, and covered with wire netting.

Something more should be said of the cellar. It cannot be too often repeated, that the purity of cellar air lies at the foundation of the purity of house air. The danger of severe and sudden illness lurks in cellars, as often as in sewers. The common practice in regard to cellars is to bury the drain under its floor—to place water-closets in its darkest corners—to store combustible rubbish in wooden bins (I have seen great heaps of paper scraps)—to pile away old rotten boards and clothes—to hang children's outer garments in it,—in short, there are few uses of a menial sort to which it is not put. The cellar is often without a proper floor, often is very dark and close for want of windows, often is darkened by placing the heater-boxes in front of windows.

To these sources of pollution (for darkness is one source) add the fact that in cold weather a powerful outside pressure exists, forcing air into the cellar, and thence into upper parts of the house. It is too much to expect that an average cellar will be so pure, so free from all these objectionable things, that air may safely be taken up from it by furnaces for the consumption of the house.

Let the floor be concreted or asphalted so as to be air and watertight. Put no drain underneath, unless in a trench with a wooden or stone cover. Put *one* large trap outside of the walls for each sewer, ventilate it by an opening just inside the trap; run the soil-pipe up full-size several feet above the roof, and protect it from rain; ventilate the trap under each washstand. Have no water-closets in the cellar; or if they be thought necessary, isolate them in separate chambers of masonry with abundance of light, accessible to the children from the outside only of the house. Give a plenty of windows, and good height, and keep the walls whitewashed.

Some are in favor of "direct radiation," *i. e.*, of heating by coils placed in the school-rooms. It is economical of heat, certainly, for a great deal is wasted in the cellar by the arrangements which are now common; but this waste cannot be necessary. The objection to "direct" heating is the deficiency in the supply of fresh air. The same objection holds good in the case of "hot-air furnaces," if they are driven excessively, and deliver a small quantity of over-heated air. The latter condition should be rectified by making the furnace and its channels

of inlet and delivery *large enough* to give an abundant volume of *warm*, not *hot*, air. There is not much to choose between a red-hot furnace and a steam-coil. The coil can, however, be treated as a stove is treated in figure 3, and all objections to its use will disappear.

It must be constantly borne in mind, that the scholars are not to be exposed to draughts of cold air when it is possible to avoid them. In every way, we should try to warm the air, even a little, before it enters. The methods given in figures 3 and 4, should be considered as the best substitute for perfect ventilation, but as distinctly inadequate to supply the air required, unless supplemented by those which warm the air before entering.

In a room heated by direct radiation, and provided with a strong exit-draught, the air seeks to force an entrance on all sides. If it enters by opened windows it causes draughts. If the windows are closed, a portion must come from entries, halls, cloak-rooms, closets, cellars. In fact, all the lower parts of the house are naturally drawn upon, when windows are closed.

A point against the direct method of radiation is the difficulty of governing the amount of heat in mild weather. This should be considered, however, as a defect of arrangement. Coils should be in duplex or triplex systems, and it should be easy to shut off steam from one-half or two-thirds of the pipes.

No system of flues, however skillfully and liberally planned, is likely to take the place of windows altogether. This paper has already made the assumption that school-houses require but half the amount of fresh air which is required for permanently occupied houses. What justifies the assumption? and what conditions must be looked to in order to supplement the assumed deficiency? "Thirty cubic feet of fresh air per minute and head" will not keep a closed room fresh for two or three hours of uninterrupted school-work. Four other things must be alluded to :

1. Frequent airing-out of the rooms.
2. Systematic opening of windows.
3. The original floor plan.
4. Cleanliness.

1. Troops on the march are accustomed to halt ten minutes at the end of each hour. A school should also have its halting times (and once in an hour is not too often), when the air may be renewed by a quick and brief opening of the windows, while the pupils go through some light gymnastics. A principal use of the fifteen minutes' recess is to effect this more thoroughly. A complete renewal should be accomplished after each session, and no room allowed to be closed after sweeping until the dust has wholly subsided as far as the sense of smell can judge.

It is no wonder that teachers are glad to get rid of the old-fashioned school recess. Houses are now placed in the midst of thickly-settled towns, where the children, if they are allowed to run in the streets, are in personal danger, and if kept in the yards, have hardly elbow-room. Their shouts annoy the neighbors—though shouting is really one of the best parts of their play. Some teacher has to watch them while in the yard; and this must be, especially for ladies, one of the most difficult and distasteful parts of the teacher's duty. If the rooms are aired out at recess, some of the delicate or lazy, or over-studious, will object to the draught. I know a school where there is but one yard for boys and girls; they have, therefore, a recess at different times for the two sexes, and one-half of the scholars are always left in the rooms, so that no airing-out is possible. Still, the uses of recess remain. To provide for the delicate children, or for the case of bad weather, a play room, warm, airy and light, ought to be provided.

2. No apparatus that can be named will do so much good at a very small cost as the window-board. By that term I mean a plain piece of board, as long as the window is wide, and from four to eight inches wide. The lower sash is raised, the wood is inserted, and the sash is shut down upon it. The air enters in a thin stratum passing upwards between the upper and the lower sash, in a nearly perpendicular direction, without causing perceptible draught.

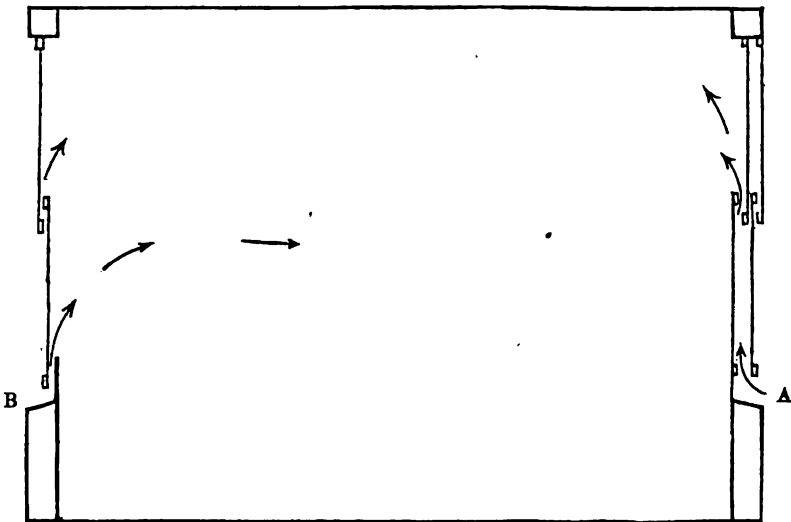


FIG. 7.

The diagram (fig. 7) represents a window provided with the board, and air entering at A. The window is, however, represented as

double; this gives great protection from the cold, and also enables the air to enter the room slightly warmed by contact with the lower pane. All four sashes of double windows should be movable.

At B there is a different arrangement, for mild autumn or spring weather. The board is made wider, and is placed an inch or two from the sash, in such a way as to direct a current upwards. If tilted (fig. 8) the cold current strikes the bodies of the scholars.

Opening at the top is not so safe as this method in cold weather.

The direction of the currents (shown by arrows) cannot be uniform, but must be ascertained by the teacher, who should occasionally occupy a seat at different distances, to note the effect.

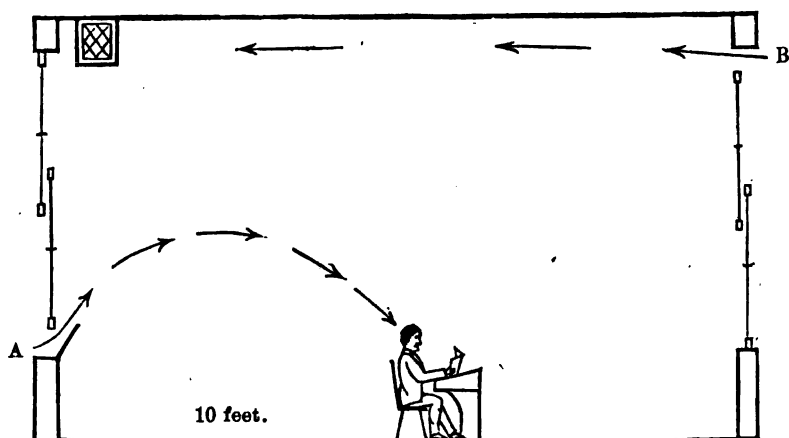


FIG. 8.

Figure 8, B illustrates a tendency which air currents possess to cling to surfaces which they have come in contact with. The top of the window is close to the ceiling, and a strong current passes straight to the ventilator, doing no good in its passage, and retained in its elevated course by momentum and cohesion against gravitation. The air from the top of a window usually falls, of course.

The window-board is sometimes pierced with holes for the tin pipes which are bent upward at right angles. This effects the above-named results at a greater cost.

A kind of mosquito-bar, covered with thin flannel, may be used to sift dust from the air. But dust-sifters are air-stoppers. Such apparatus is not adapted to the case of rooms with many occupants.

3. In planning a house, it is well to place the windows and doors so that those slight currents which enter by cracks or by partial openings may traverse all parts of the room. We thus call to our aid a correct principle of "natural" ventilation which should not be lost from sight

even when we think our artificial methods are perfect. Let each room be adapted to the rapid renewal of its air by swift currents which reach every corner as soon as windows and doors are flung open; and let this kind of airing occur more than once in each day's work, and once after each day. Such a room is seen in Fig. 9. A room planned as in Fig. 10 will be likely to have less perfect ventilation. And Fig. 11 shows a still more decided error. (Compare rooms E and F in Fig. 13, which are well ventilated.)

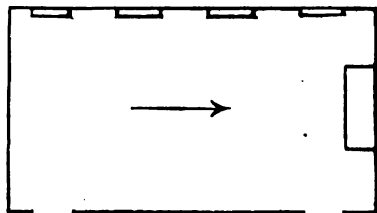


FIG. 9. A room well shaped for imperceptible ventilation, or for quick change of air when desired. Two doors four windows. Pupils face direction of arrow.

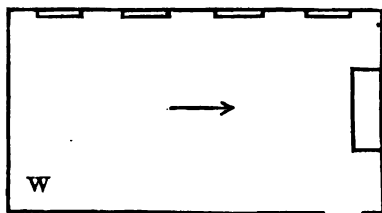


FIG. 10. Ventilation more liable to be imperfect. One stagnant corner at W.

A corridor or hall may be regarded as a supplementary aid to ventilation. It ought to have sufficient means of heating, and here, if anywhere, is the place where direct radiation is suitable. It should run straight through the house and have practicable windows at both ends which should be open except in the severest weather. Not being occupied by scholars the air will be easily kept pure under these circumstances. The use of transoms over doors is to draw upon this supply of pure air.

The school-house should be so cut up by corridors that every room should have a corridor running along at least one side. A house thus cut up is analogous to a city with broad streets; the air circulates more quickly and in larger masses.

The heaping or packing together of rooms is a distinct impediment to ventilation. The air which passes into a room through unperceived channels may be estimated as sufficient to change the contents of the room once in an hour. Now, every room has four sides, a top and bottom. Examine the condition of a room thus packed — say one of

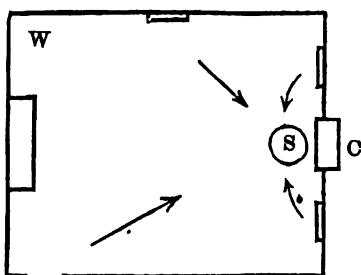


FIG. 11. The chimney, C, draws air from the room by two ventilating holes. The stove acts in like manner. Air entering by small cracks at a door and three windows, taking the direction shown by arrows, leaves the corner W, unventilated. Taken from a school in Rochester.

the middle rooms in Fig. 12. It has a cellar below, rooms on three sides and above; hence its unperceived renovation of air must come

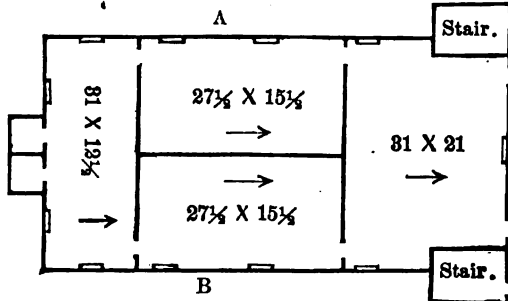
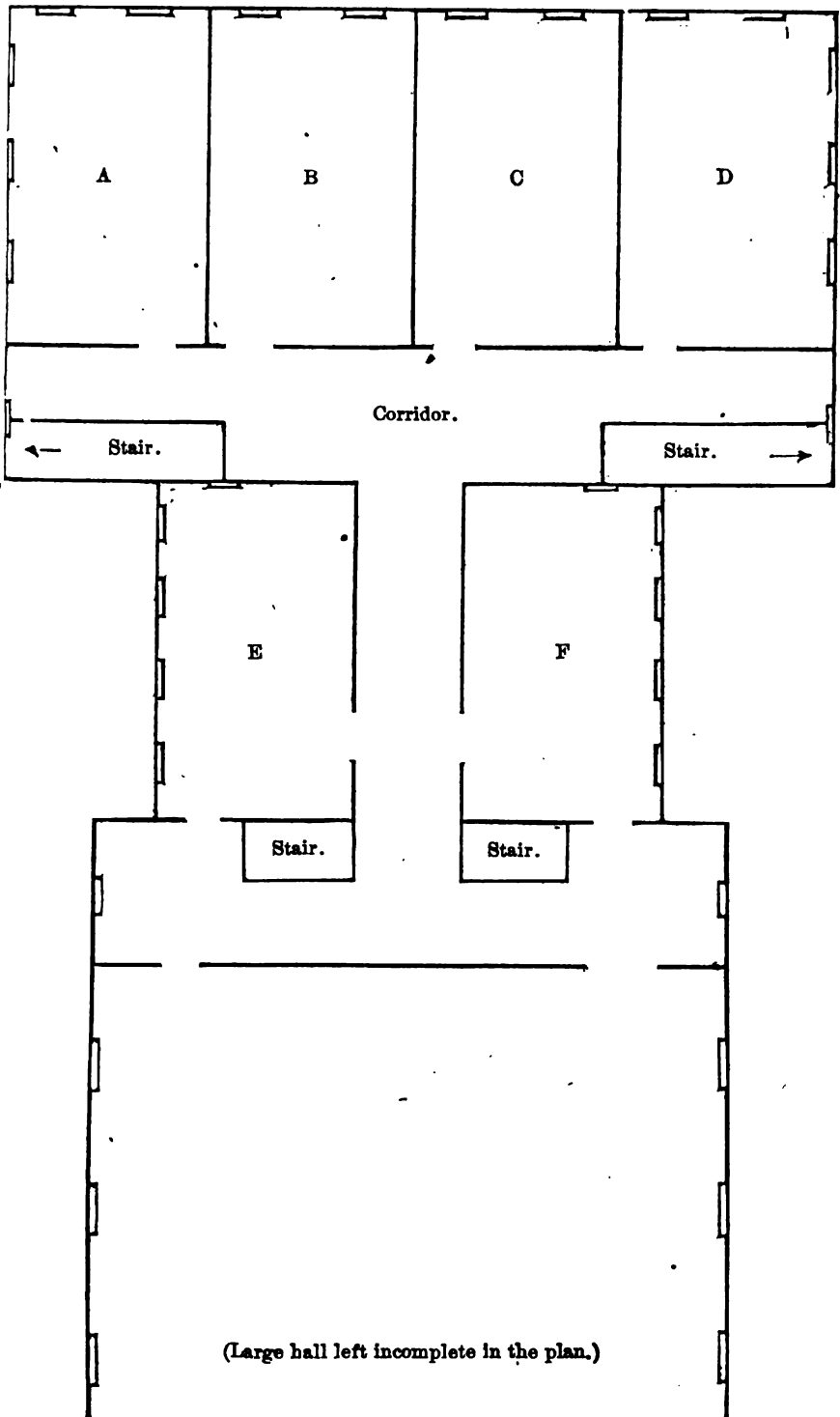


FIG. 12. Seventh Ward School, Troy. Unsurpassed for compactness; glass partitions; pupils face the light.

very largely from impure sources. Wind blowing from A will force air into B; wind blowing from C will force the air of the front room through the middle and rear rooms. The very multiplication of partitions, however, is itself a check to currents of air.

Figure 13 shows a good use of corridors. Better still, if rooms A, B, C, D, had been placed lengthwise along the corridor.



(Large hall left incomplete in the plan.)

FIG. 13. School No. 2, Yonkers.

The analysis of plans of school-houses leads us to form a distinct class or group of those which have recitation rooms as an adjunct to

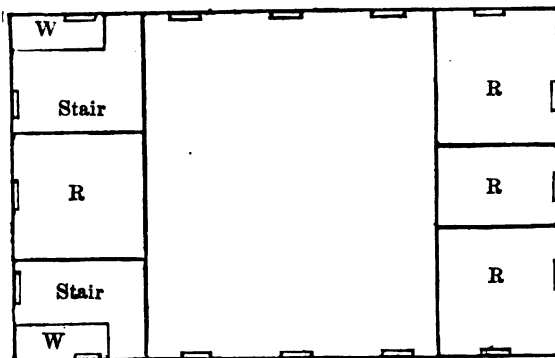


FIG. 14. Thirteenth Street School, Troy, old pattern; once for instances of bad air and crowd-

ing. It is not sufficiently remembered by school builders that the class requires pure air when reciting as well as at other times. One half of the scholars are sent in to the small rooms, which in aggregate space may equal one-third of the room they leave. Those left behind enjoy tolerable air; while commonly those reciting are intolerably confined and cooped up, without a chance for relief (for draughts at close quarters are dangerous) until the hour is over. The example following (Fig. 15) shows an improvement in two respects, as indicated in the note to the cut; it is evidently based on the previous model, while the two following show a like affinity for each other (Figs. 16, 17). The objections on the ground of light will be named on a later page.

Poor ventilation is so often connected with over heating that the latter must be ranked with it as a cause of ill-health. Hot rooms are a common cause of "taking cold." They give a headache to some. They sometimes aid in keeping up a forced ac-

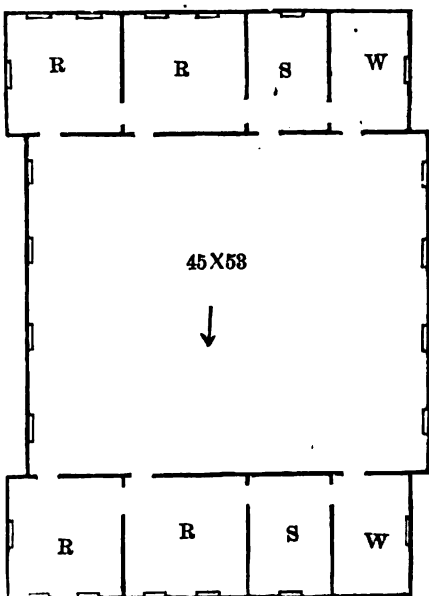


FIG. 15. Sixth Ward School, Troy, built four years ago. (R, recitation rooms, about 16 feet square; S, stairs; W, wardrobes.) This figure shows the recitation room system; size of R still too small for the number that occupy them; breadth of large room between windows more than is desirable. The improvement, as compared with Fig 14, consists in the placing of the stairs at both ends.

tivity of the circulation of the brain and nervous centers, causing nervous irritability and sleeplessness. Weak sight, especially near-sight, is greatly aided in its development by hot rooms and bad air. The heat acts at once in flushing the face and producing congestion of the eyes. It acts indirectly and chronically by producing a slow debilitation of the system and impoverishment of the blood. Such a condition is most favorable to the production of weak or short-sight. Bad air, poor food, late hours, overwork, dissipation, anxiety, are causes which work toward the same result.

What is "over-heating?" It is a little difficult to reply. However, it is certain that there are teachers who succeed in keeping themselves and their classes comfortable and cheerful at temperatures ranging from 60° to 65° Fahr. I have seen a boy of ten years sitting in shirt sleeves, having taken his jacket off because he was too warm; the thermometer stood at 62° on the desk beside him, and the other pupils were comfortable also. It is clear to me that the range from "68° to 74°" is decidedly too high for a standard. Some teachers may require this degree of warmth, especially if suffering from colds; but a lower range, even one which has 68° or 70° for its highest point, seems desirable for schools.

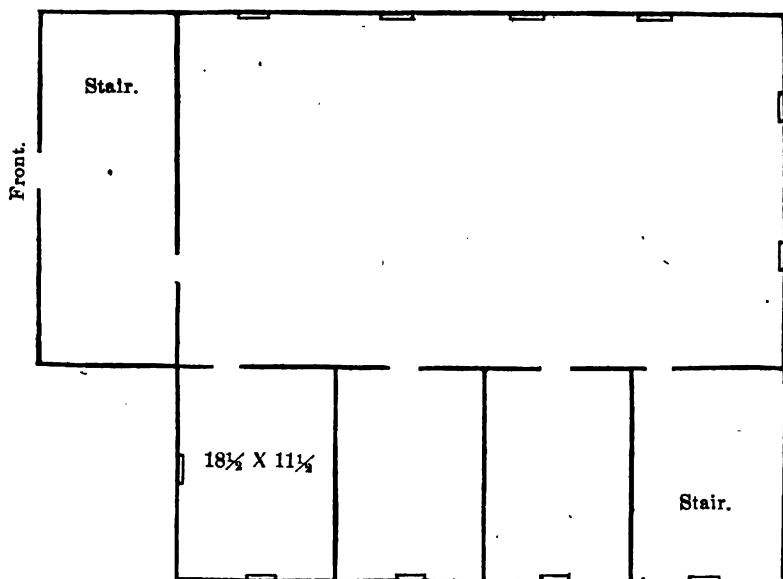


FIG. 16. Court Street School, Utica. Compact arrangement, four rooms contiguous. Could easily be enlarged so as to give four rooms, forty scholars to each room, with corridor in middle. Arrangement bad for airing small rooms.

4. There is an invisible something which clings to the substance of wood and plaster, and continues to give out a smell after the air has

been renewed. This sort of emanation cannot be conducive to health. It brings startling suggestions of "hospitalism," or hospital smells and infections. Whoever will aid in banishing this smell from schools is a benefactor. Strict cleanliness is the remedy, associated with good ventilation.

It is not superfluous to say that once or twice a year is not often enough to wash the school-room floors! Schools do exist in which the washing is done weekly on Saturday morning, the sweeping daily after sessions, and dusting daily, in the morning everything being finished half an hour before school opens.

A floor ought to be non-absorbent. Seasoned yellow pine and maple are both good materials; they can (especially maple) be so prepared by oiling as not to need washing, but only the use of a damp cloth.

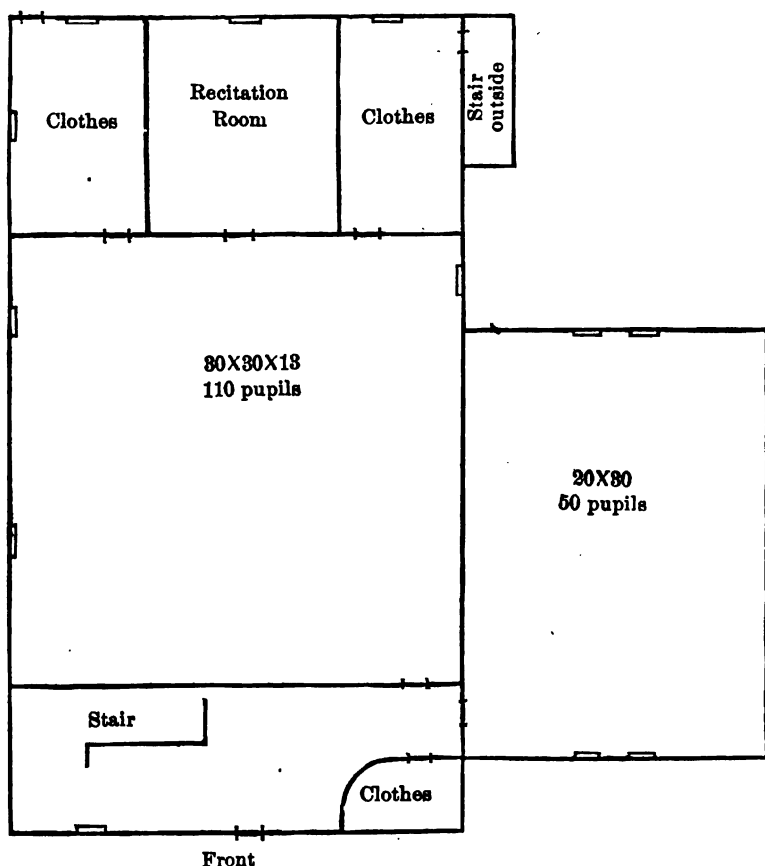


FIG. 17. Francis Street School, Utica. Light insufficient in large room. Compact arrangement interferes with lighting and airing. Very badly planned for natural ventilation.

Dust comes from the mud brought in upon the children's shoes. There ought to be no muddy school yards. The use of mats and scrapers must be provided for and enforced.

Children of the poorer classes come to school with their clothes smelling of the day's cooking, and much else. Teachers and charitable visitors can do much to encourage or compel children to come with clean and decent garments, and clean face, hands and hair.

It is not proper to hang overclothes in the rooms where scholars sit. A closed wardrobe or closet in the school-room condenses the effluvia, and concentrates the effect of packing a quantity of moist, reeking rags. The chance of diffusing infection is increased by such contact. A closet should be large enough for each child's clothes to hang without overlapping another's. It should have good light, and free circulation of air, and be well warmed. If the corridors are wide, warmed, airy and light, a portion may be set off by a board partition for the use of each class, the boards to reach six feet in height, and to come within six inches of the floor. If clothes are hung in the basement, care should be taken that the furnace does not send the air of the clothes-room up-stairs.

Walls that can be washed are a desideratum; paint answers the purpose well. Wall-paper is so pretty that it is a pity to condemn it; but it is very absorbent, and not allowable under strict sanitary rules where large numbers are congregated.

LIGHTING, AND EYE-SIGHT.

The influence of school-life in promoting the increase of near-sight, is by this time one of those commonplaces of which the reader cannot be supposed to be ignorant. Germany, Russia, Switzerland and France have all contributed statistics, showing that the affection is a universal epidemic, localized wherever severe study is pursued, attacking all grades except the very youngest, and increasing in regular progression from the commencement to the end of study. At the moment of writing, a paragraph is going the rounds of the newspapers, giving the statistics of the six hundred pupils in the High School of Chemnitz, Saxony, in which, in eight classes, beginning with the lowest, the proportion of near-sighted is respectively 10, 17, 20, 25, 35, 44, 44, 64 in 100. This one series is a fair representative of a score, all made with great care and exhibiting the same result.

The case is different in America—but only in degree. Children study a good deal less, their school accommodations (in cities, at least) are better, and their mode of life in some respects is better, than in Germany. But there is a considerable amount of near-sight in this country. Three hundred and twenty-one students were examined by

Dr. Derby on entering Amherst College, and 35.9 per cent were found short-sighted. One class entered with 44 per cent and graduated with 50 per cent. In brief, although we have less absolute near-sight, still, that which we have, is of the same nature and tendency; it is engendered by study, and is increased by continued study as rapidly as in Germany.

The percentages of near-sight in 2,500 public school children, examined by Drs. E. C. Loring and R. H. Derby, in New York city, were 3.5 for the youngest classes and 26.78 for the oldest. The poverty of blood and weakness of fibre which are produced by bad ventilation and over-heating contribute to the causes of near-sight in no inconsiderable degree. The point of most immediate interest, however, is the amount and distribution of light in school-rooms.

Certain fashions in architecture interfere with the requirements of airing and lighting. Pointed windows, heavy mullions, buttresses and cornices, may do so. In all styles, except that based on practical usefulness, the size of and position of windows are subordinated to architectural effect. Small sized windows are employed to produce an effect in the façade, in that domestic classic style which was so much in vogue in the early part of this century, and which has left traces upon our school architecture. A frieze, in a classically proportioned house, occupies a band of several feet in width below the eaves, which must be kept sacred from such vulgar uses as that of windows. The frieze may not be actually there, but a place is left for it, a blank ribbon of wood or stone above the brick wall and the window-heads. Classic usage requires a strict subordination of windows; one might almost say, a suppression.

In certain places there prevails the singular custom of making the upper story much higher than the lower. For example, in Rochester School No. 19, the distance from the top of the glass to the ceiling is 28 inches in the first story and 78 inches in the second. The High school at Binghamton has four stories, the height of which, beginning at the bottom, is respectively 14, 15, 16, 17 feet. This practice is related to the custom of using the upper story for a large hall or assembly, but it has been retained (from habit?) in cases where there is no such hall. It has the advantage of airiness, but the architects have not seized the full advantage of the arrangement by carrying the windows up near the ceiling. A certain loss of light results, which is seriously felt in certain cases, as in that of the High school at Rome in Oneida county (a classic structure).

Glass sliding-doors are still in frequent use in some places, but I am inclined to think that they are going out of fashion. It is doubtless supposed that they give aid in lighting the rooms; but this is very questionable.

During the investigations referred to in the report of the Committee upon Public Institutions, there has been frequent opportunity of comparing houses built upon similar plans, but differing in this one respect; and it has not seemed that those with glass were better lighted than the others with solid partitions.

From a theoretical point of view, we must consider :

1. That the glass in the partition reflects a part of the light and throws it back out of the window.
2. That it absorbs a part.

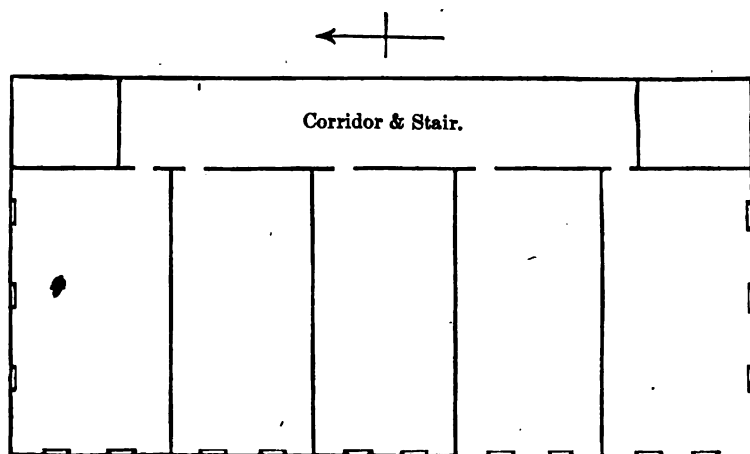


FIG. 18. School No. 13, Rochester, Second floor. Division into five equal rooms by glass partitions. Very poor light and diminished ventilation in three interior rooms.

3. That it allows a part to pass straight through and out by the windows of the opposite side of the room or house. To this add the fact, that in examining the plans of houses where glass partitions are used, we find that there is not generally light enough to supply each separate room, supposing the partitions to be solid walls; from which we are entitled to infer that the planners thought that the supply was increased by using glazed partitions. Figure 18 will illustrate this. No one could suppose that the architect intended to illuminate those long slips of rooms by two moderate-sized windows at one end; but in reality the light does come almost wholly from that quarter in all the inner rooms.

Figure 19 shows a more recent plan, which looks attractive. The middle room of three receives light from the rear and two sides. Why does it not receive enough? The answer is a two-fold one: First, because so much side-light is cut off, and second, because the side-light is so distant and slanting.

1. To a person standing in A (see fig. 21) the objects in B seem less distinct than those in A. A part of the light is thrown back from the glass into A, as we may see by the reflections on the sash. The ceiling and floor of B are darkened by the wooden framework, and the grooved beams in which the door-heads slide. A person at B notices an increase in the light when the sash is opened.

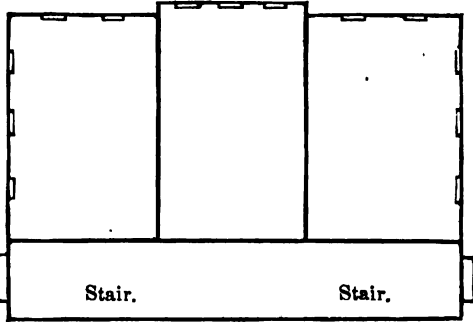


FIG. 19. School No 24, Rochester. Three rooms 32 feet long, with sliding glass partitions.

2. A side-light from the window at A cannot be expected to be of much use beyond the width of A. It strikes B too obliquely. The

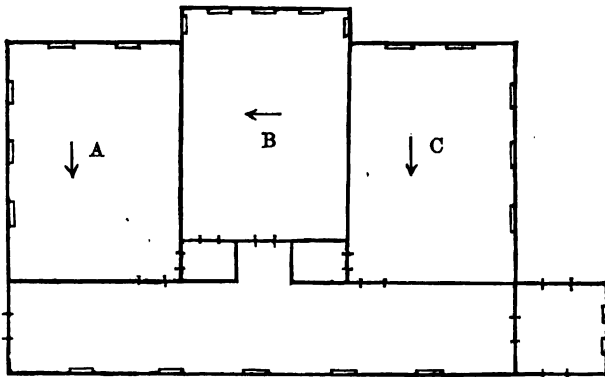


FIG. 20. School No. 26, Rochester; built 1879; first floor. Here there is an evident attempt to remedy a defect in such a plan as that of Fig. 19. The middle room is of the same size as the others, but has five windows all at one end; a great gain as compared with No. 19. The inferiority of B to A and C is still evident, however.

The simple rule of allowance for depth is, that no window shall be required to throw light to a horizontal distance greater than once and a half its height, supposing its head to be quite near the ceiling. The diagram represents a row of rooms, each twenty-four feet

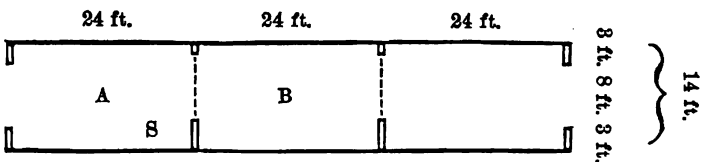


FIG. 21. Diagram of section three, rooms from side to side, with windows in the outer rooms and glass sliding doors between. (From Fig. 19.)

may be sufficient as far as the mark S on the floor. If the house stands on a large lot with a wide, open outlook, the inner seats, in A, will be well lighted ; but in an average street, with houses of moderate size opposite, they will be poorly lighted. A portion of the light in B will be very poor, indeed. Finally, the light that goes through from A to B is chiefly lost to A ; if a smooth white wall were put instead of the glass sliders, the

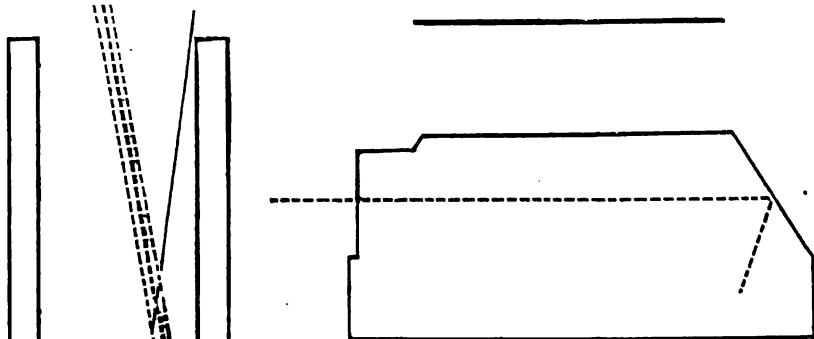


FIG. 22. Cross section of room with sloped inner wall, with a ray of light reflected from wall.

wall would throw the light back upon the desks in A. This part of the light is really needed, and it is most needed just where it comes, at the back of the room. A good deal is gained by slanting the inner wall (where that is feasible) so as to throw the light more directly downwards, as in figure 22. The writer has knowledge of one room in the Albany High School which is a favorite with the pupils for this reason. But even an up-right wall is of much value as a light-giving surface. The ceiling is of great importance in this respect, and must not be cut up by cross-beams ; it should be white, while the walls are tinted very slightly in some neutral color.

If these three rooms were thrown into one, the product would be a room of the width of that in the Syracuse High School (fig. 23), which is seventy-four feet across and fourteen feet high (this is not a solitary case either), with windows two feet from the ceiling and two and a half feet from the floor. A ray of light is seen analyzed into three parts, A= $\frac{1}{12}$ ths, falling on the desks in the left hand half ; B= $\frac{1}{12}$ th on the desks in the right hand half ; C= $\frac{1}{12}$ th going out of

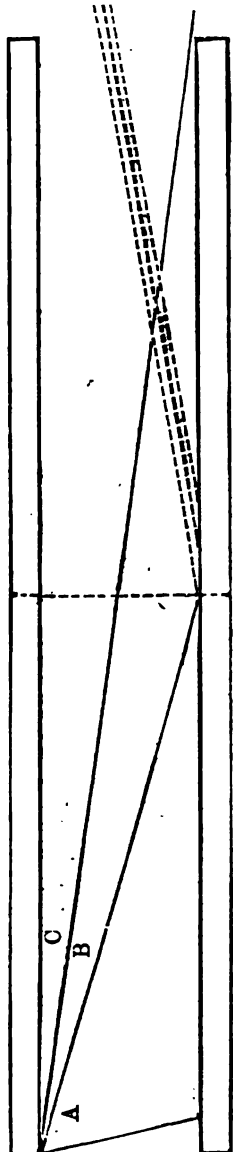


FIG. 23.

the opposite window (the dotted upright line represents the imaginary middle line of the room).

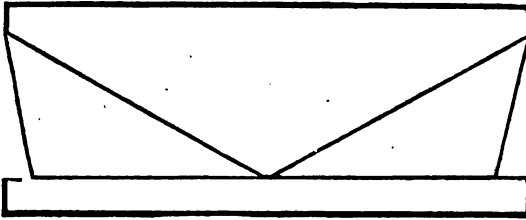


FIG. 24.

light from the *center* of a window strikes a desk in the middle of a room like that of the Syracuse school. Let the reader note also, that

Figure twenty-four is a room half as wide as figure 23, introduced to show that the light falls twice as directly upon the desks.

Fig. 25 represents the angle at which the

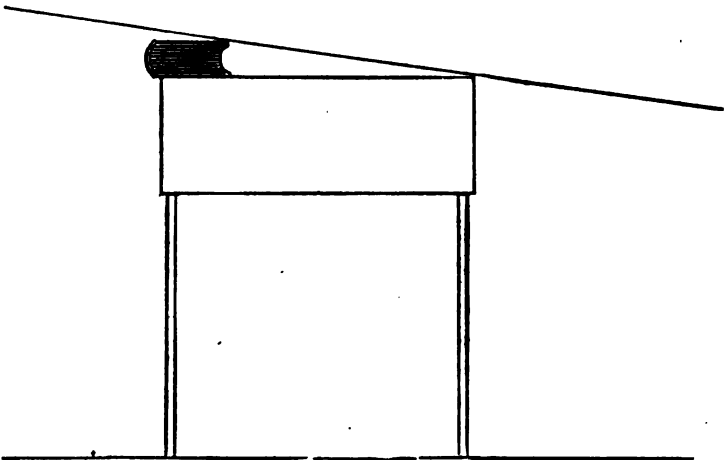


FIG. 25.

this is the angle at which the light strikes the inside desks of a room thirty-five feet wide, lighted from one side, and he will be ready to admit that this depth is properly condemned as altogether too great a for successful lighting by ordinary methods.

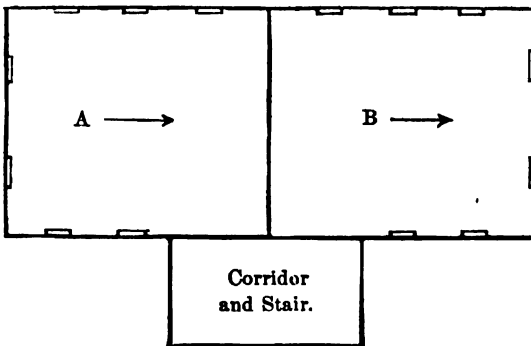


FIG. 26. School at Hoosick Fall

that is within six inches or thereabouts.

The most valuable light is that coming from the center and upper part of the room or window. The more perpendicularly it strikes, the better. Therefore, the window-heads ought to be as near the ceiling as possible;

A few more illustrations of imperfect lighting may profitably be added. Fig. 26 represents a school at Hoosick Falls. The two rooms, which constitute one floor, are each thirty-five by thirty feet in size. A sliding glass partition throws both into one, for the purposes of exercise in common. This presupposes that the scholars face the same way in both rooms. The windows at F F are necessarily closed, and the light in B becomes insufficient, the combined area of the glass equalling one-fourteenth of the floor space. Other instances of facing the light for a similar reason are shown in figs. 27, 31-34, and others, where, as usual, the arrows show the direction of the facing.

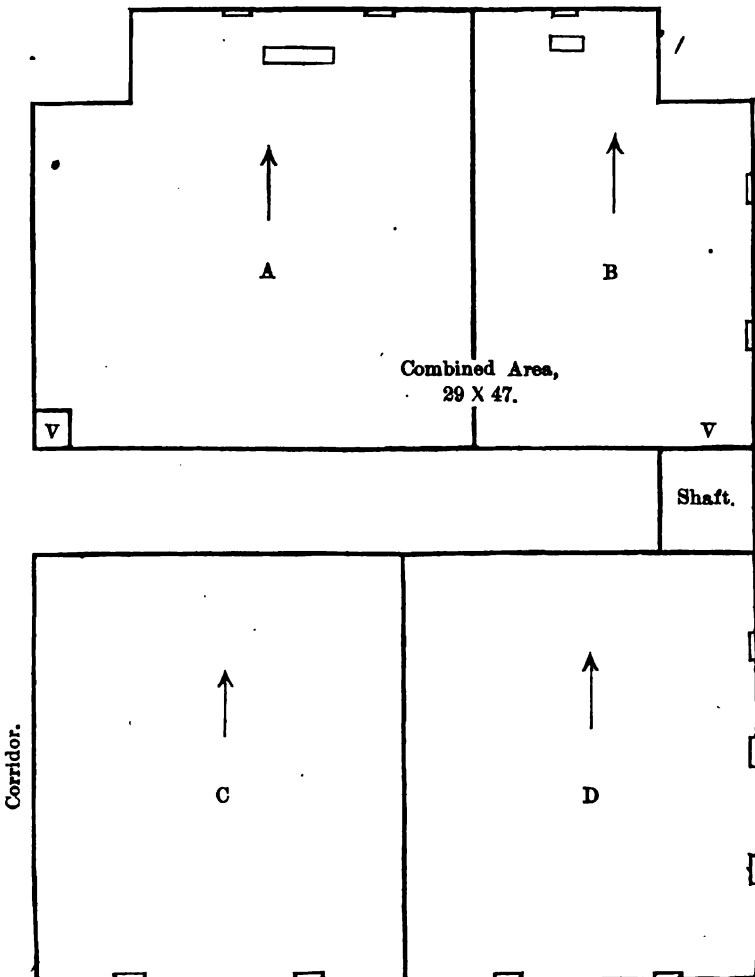


FIG. 27. School No. 10, Rochester, third floor.

Fig 27, represents four rooms in the upper story of school No. 10, Rochester. The corridor occupies the left hand, but is not given in the drawing. The four rooms are entered by an alley between glass sash-work. The partitions between A and B, C and D, are of glass. A and C are poorly lighted; A especially so, since all the light, with the exception of a little from the windows in B, comes from directly in front. There are, of course, windows in the outer corridor wall; they may be said to be thrown away for the purpose of lighting the rooms, and the same criticism applies to figures 18, 19, 20.

The arrangement is an extremely bad one. Even the shaft (for ventilation) is so situated as to take the place of one window, and the towers (indicated by indentations at the corners) take the place of at least one window.

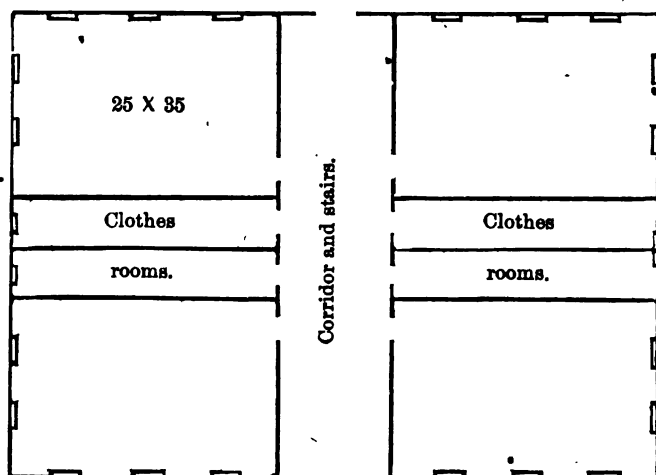


FIG. 28. Type of a school house with none but corner rooms.

It is easy to see how this plan might have been changed. The house is nearly square, and the dimensions would easily admit of four oblong rooms on a floor, with the entry or hall running straight through between. Upon this plan are built schools No. 15, Rochester, and 21, Albany, both at present fairly well ventilated, owing in large measure to the arrangement which gives thorough ventilation of the halls, assigns to each room two exposed surfaces, and does not allow any two class-rooms to come in contact. The scheme is illustrated in Fig. 28.

The difficulty in the case of corner rooms is, that either the scholars or the teacher must face the light. To many teachers this is a serious evil. Injury may easily be inflicted on the eye-sight. If the teacher is much employed in work with the blackboard, and the maps, and reading-charts, and is more on her feet than in the chair, the difficulty

may be overlooked. But if obliged to sit while conducting lessons or overseeing study, she should be protected by a screen. Such a screen is in actual use, and is much prized in all the rooms of the Albany High School. There are two patterns, one wholly of wood, the other a wooden frame covered with cloth and sliding on an iron bar with a heavy foot. (Figs. 29, 30.) They are placed on the desk in front of teacher. The ideal schoolroom is one with only one exposed side, whereby the most uniform illumination is secured. (Fig. 9.)

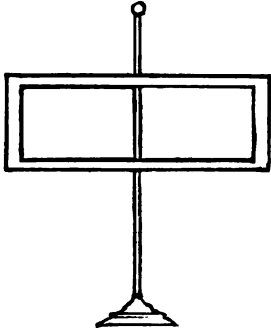


FIG. 29.

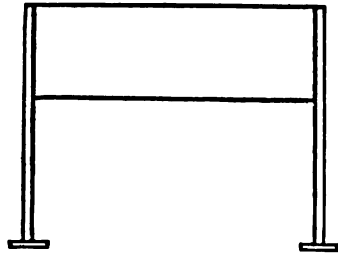


FIG. 30.

Country schools are apt to be incorrectly lighted. But few are so badly off as this octagon (fig. 31), where each scholar faces three windows and stove, or the oblong (fig. 32), where the case is nearly similar.

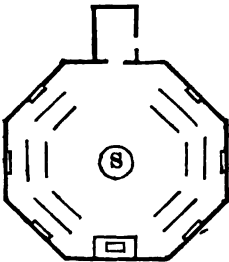


FIG. 31.

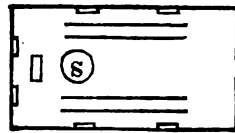


FIG. 32.

The principle that scholars should never face a light when at work is violated in the case of the long room (fig. 33) in the Union school at Schenectady. Here are seated one hundred and fifty scholars of nearly adult size, all facing in one direction. Those who occupy the forward part of the room are under great

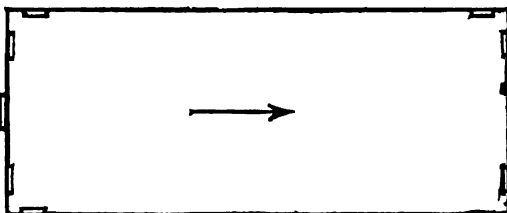


FIG. 33. Schenectady Union School.

disadvantages, as the light which comes from the rear is distant, and that in front is near. The room measures sixty-seven feet by twenty-seven feet. The building was originally a college.

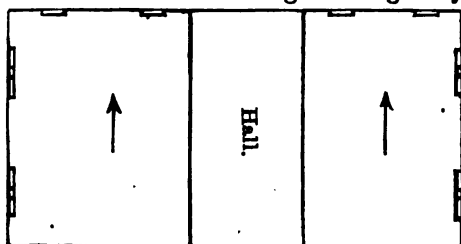


FIG. 34. Schenectady, Park Place. Facing light, needlessly.

It would be hard to re-arrange the inner partitions so as to give good lighting. Fig. 35 is a room used for class work, 56 by 34 feet, having all five windows at one end. Fig. 36 gives a room devoted to drawing, with the windows similarly placed; it is 34 feet square. And as an instance where the occupants consider the light superfluously abundant, fig. 37 is a recitation room in the third story, 32 by 18 feet, with five windows, having a glass-area—1-5.3 of the floor-area, with a free sky in front. The area of glass in fig. 35 is 1-16, and that in fig. 36

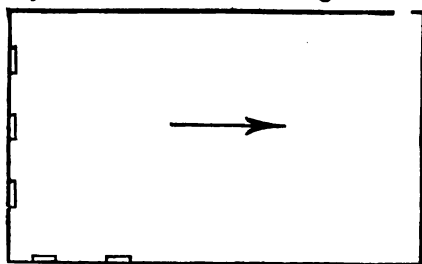


FIG. 35. (Defective lighting.) Room 56×34 with 5 windows at one end. Brockport Normal School. Windows badly placed and insufficient (glass area = 1-16 of floor-area).

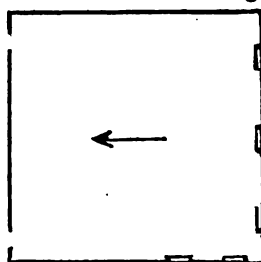


FIG. 36. (Defective lighting.) Room 34 feet square, with 5 windows. Badly placed insufficient. Brockport Normal School. Used for drawing and writing. (Glass-area=1-9.6 of floor-area.)

1-9.6 of the floor area. These instances are confirmatory in a general way of the principle that glass-surface should equal from 1-5 to 1-6 of the floor-surface, in all but exceptionally open places.

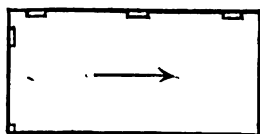


FIG. 37. (Light superabundant.) Room 32×18, windows advantageously placed, glass area=1-5.3 of floor-area, and the room looks fully upon the sky.

Fig. 38 is a room 50 by 35 feet, lighted on three sides. The large platform is placed opposite the door; hence the scholars must face four windows. For the case of this badly-arranged room the remedy is simply to reverse the position of the pupils. This would, however, give discomfort to a teacher unless a screen were used.

Fig. 39 is an old building. The lighting

of the main room is excessively bad. Nearly one half (the rear 18 feet), has no windows, and the scholars face three windows. It is not

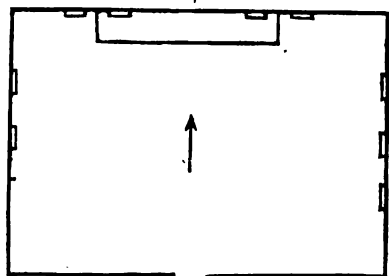


FIG. 38. (Defective lighting.) Room 50' x 35'. Scholars face four windows, which have to be darkened. The width of 15 feet in middle of room is imperfectly lighted by side windows. (Rochester, No. 2.)

feasible to reverse the seats for that would bring the teacher's desk to D, which is quite in the dark and faces three windows. The upper story is curiously divided (fig. 40), with one room of very singular proportions: 8 x 12 feet.

Fig. 41 is a one-story brick school at Brookport. With only three rooms, there are provided three entrances (R, T, W are the vestibules). Room C is badly

lighted. Lighting has been sacrificed to the symmetry of the plan. If the vestibule T had been dispensed with, and R S moved so as to cover the end of B, C would have gained two windows. Room A has one superfluous window, which embarrasses the occupants.

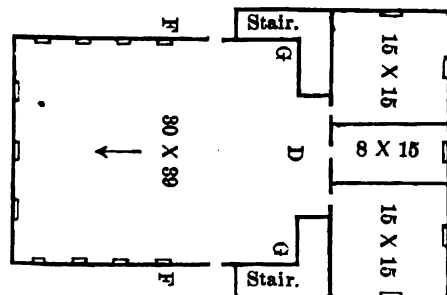


FIG. 39.

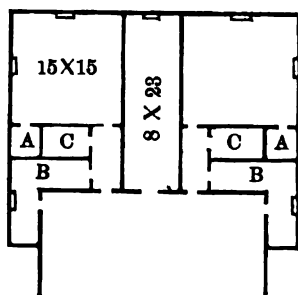


FIG. 40.

The corridor ought not to occupy the side of a house, unless that side is known to be undesirable for furnishing light. Exceptions may be made under fit circumstances. But when a house is placed on a narrow lot, under circumstances which make it even possible that the side lots may be built upon, it is folly to waste the best light (that on the street-front, in cities, may be called such) by occupying it with corridors. If it be thought necessary to use narrow lots, they should at all events run back to the next street. But the necessity does not exist in any non-metropolitan city.

One of the chief recommendations of a plan like that of fig. 28 is the freedom of exposure to the sun's direct rays. Corner rooms are wholesome to live in, and it seems undesirable to occupy that part of the plan by staircases, as in fig. 42.

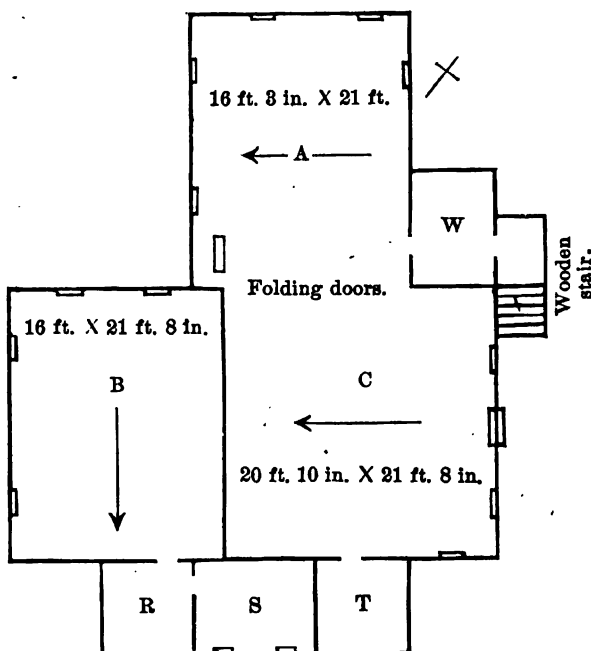


FIG. 41. Brockport Common School, floor plan.

It will be a useful exercise for any one who is concerned in the plan for a new school, to take some of the outlines here given, and try to alter them in accordance with just principles. Take fig. 42 with its simple oblong form, and try to redistribute it; with straight halls going clean through; with corner rooms, as many as convenient; with the oblong figure preserved in each room if possible; with 600 square feet floor to each, or nearly that, and more if wished; with dressing-rooms of sufficient size and properly lighted; with no room so packed as to touch other rooms on more than two sides.

The dimensions of rooms for study should not be excessive in either direction. Very large rooms cannot be lighted from one side, which is desirable in order to avoid cross-light. If both sides are used for windows, the scholars necessarily receive light, one-half from the right hand and one-half from the left. The former is objectionable in writing or drawing because the hand throws a shadow on the page. The ideal room is lighted from one side only (Fig. 9), and its size is limited by this one condition; for the height of such a room cannot be placed at more than fourteen feet, and this limits the available width of the room (equals one and one-half times the height of windows) to twenty or twenty-one feet. The width of an aisle being added on the

inner side gives twenty-four feet as the maximum desirable width for an ordinary schoolroom. The dimension in the other direction may be greater but is limited by the need of having all the children read words on the blackboard. Thirty-two by twenty-four, and fourteen in height, gives a cubic space of 10,752 feet.

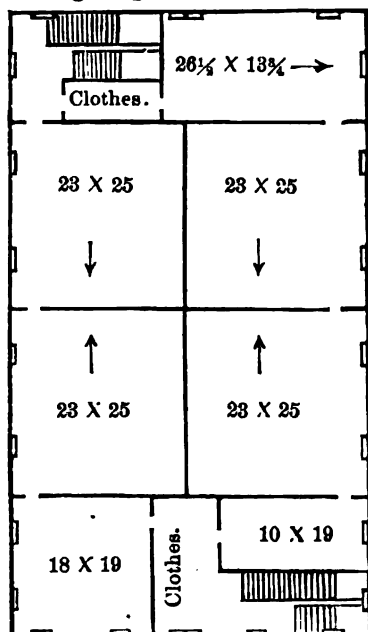


FIG. 42. School No. 14, 2d story. eight times in an hour (which is probably near the maximum of safety), the result is forty-eight pupils and 225 cubic feet of space to each.

If a larger class must be accommodated, the room may be lengthened. A room 25x35 accommodates fifty-four pupils with the above allowance.

The committee of award in the competition for the prize for the best school-house plan (offered by the "Sanitary Engineer") assigned fifteen square feet of floor area as the minimum for each scholar, and the maximum height of rooms as fourteen feet, making a minimum of 210 cubic feet of space with this height, 196 feet with a height of thirteen feet, and so on.

SCHOOL DESKS AND SEATS.

There is difficulty in ascertaining what is wanted in the case of these articles. Some think that ease and a comfortable support for the body constitute the chief object of a seat; they naturally prefer a seat which tilts back a little, or compels the reader to do so. Others wish the

The next step is to ascertain how many scholars may safely be placed in the room. That depends on the amount of fresh air that can be introduced. It may be assumed that it will not cause dangerous draughts to bring in enough air (in suitable ways) to change the entire atmosphere once in ten minutes, or six times in an hour. The hourly supply is therefore 64,512 cubic feet of fresh air. Divide this by 1,800, the quantity assumed as required by each schoolboy, and it follows that thirty-six pupils can be accommodated with sufficient fresh air in that room. In this case each scholar has 300 cubic feet of space.

If we assume that air may be admitted more rapidly, viz., so as to change the contents of the room

habit of sitting upright to be enforced by the construction of the seat and desk; the inferences drawn from this postulate are various, some wishing to do away with chair backs altogether, and others allowing a support only as far up as the middle of the back, while a narrow strip for the spine alone is used in some (foreign) patterns.

The writer would beg to be excused from deciding between these conflicting views. The truth seems to be that it is desirable for children to be taught how to write in an erect attitude, and that certain of the school chairs, with sloped and curved backs, which are now so common in modern schools, do not assist in doing this, but have rather the contrary effect of tempting to slide into a semi-recumbent posture. Such chairs are not the best to write in, however comfortable for reading. Drawing, copying, ciphering, written exercises, writing (spelling) from dictation, writing in copy-books, and the use of dictionaries, all require an upright position. The shape of a Mexican saddle may suggest something when we are trying to fix on the proper school seat. The lower half or third of the trunk is the part which needs firm support; and the lower eight or ten inches of the back-rest is the most important portion.

The desk is used for two very distinct purposes. In writing it must be nearly flat, and its edge should project an inch or two over the front edge of the chair (supposed to be of ordinary width), and the height should be convenient, so that the arms may slide easily over it without raising the shoulders. Too great height of the lid is a common fault.

In reading, it is convenient to have the desk lid tilted a good deal. Desks are now made (very cheap and good) which enable the scholar to make the change at will.

A point much neglected is the height of the seat for little children, who often have to sit with their feet off the floor.

A desk placed too far from the seat compels the pupil to lean the body forward, elbows on the desk, in postures which are apt to become injurious to the symmetry of the body. There should not be room enough to stand between desks and chairs; on the contrary, as before said, the former should overlap the latter.

The development of near-sight is aided by desks, seats, and habits of sitting or writing, which bring the head into a bent position, and the eyes close to the paper. These habits of attitude are extremely common, and nothing is more troublesome than the constant effort to correct them. In fact, nature will assert herself in spite of our efforts, and the best plan may be to cut short the time for writing, or to interrupt it by a minute devoted to calisthenics. In fact, protracted sitting, or confinement to any single posture for more than a few min-

utes, is an injurious thing. The circulation is made stagnant. Odd or distorted attitudes become more so, and the effort to maintain a correct posture becomes irksome.

In the case of a school session of three hours, it should be a serious aim to provide means for checking the continuity of application at times. In certain schools primary children are kept for nearly this time without recess. Such a plan if it implies continuous affliction of mind, is an absurdity, not to say an impossibility.

If young children must be kept at school for four hours together, it is necessary to break the continuity of work by a long recess of twenty or thirty minutes. They should not be allowed, either, to remain in their seats during recesses, but should all be sent out to play, under the care of teachers.

Much more might be said of the excess of work which is required of young children. Six hours is still a common requirement, and the shortening of the afternoon session by *one* hour is rather a recent step in the right direction. Until lately, it has been simply taken for granted that the little ones should go and return when the older ones do. The presumption, however, is entirely in the opposite direction. A child of six years should no more be expected to keep the same school-hours as one of twelve or fourteen, than it should be allowed to have the same time for going to bed. The experience of many excellent and conscientious teachers, shows that primary scholars can very rarely be kept at work — real work — more than three hours a day. If the sessions are longer, the children have to be amused, or allowed to amuse themselves. Further consideration of this point is not, called for in this place.

NOTES ON CONTAGIOUS DISEASES OF THE EYES

IN

SCHOOLS AND ASYLUMS.*

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Many evils exist in the method of treating children upon the congregate plan in schools and reformatories. I propose in the following brief chapter to call attention to one of them which does not seem to attract the attention its gravity demands. I refer to communicable eye disease. I constantly see in my practice at the Manhattan Eye and Ear Hospital, New York, and elsewhere, patients who have contracted these diseases and got as a consequence, some lesion of the palpebral, conjunctiva or cornea, which has either resulted in blindness or such impairment of vision, or of the power of endurance of their eyes, as to reduce greatly the industrial capacity of the individual.

Diseases of the conjunctiva, and of the cornea are largely the cause of prevailing blindness, and yet they belong in a great degree to the class of preventable diseases. The fact that they do fall into this class gives to the sanitarian and to the legislators a special opportunity and advantage for inquiry, advice, and legal enactment to limit or prevent their prevalence.

Some time ago I was called to a school, in one of our counties, in which several hundred children had been gathered, chiefly from the streets of the city of New York. I found more than half the inmates suffering from a malignant type of purulent ophthalmia. The disease had rapidly become epidemic in the school and dormitories until the proper educational work of the establishment was suspended, and the insufficient energy of its entire force of teachers and nurses turned

*The occurrence of contagious ophthalmia in crowded primary schools and large asylums induced the State Board of Health to request Dr. Agnew to prepare this brief chapter of information and advice, derived from his recent and careful studies of the subject.

E. H., *Secretary of the Board.*

to fight the invader. Before I was called several cases of blindness had occurred, both among the scholars and their attendants, five children having lost both eyes and seventeen children having each lost an eye.

At my visit more than half of the inmates of the school, or nearly one hundred and fifty scholars, were found suffering from acute, communicable, purulent inflammation of the eyes in its various stages. I estimated that at least five per centum of these cases would become blind from the acute processes in one or both eyes, and that a considerable number, probably one-half, would have such morbid changes produced in the conjunctiva or lining of their eyelids as would render them liable to constantly recurring inflammation, thus impairing their comfort and usefulness, lowering their industrial capacity, and threatening them with constantly impending blindness.

These children, largely of Irish parentage, had been gathered in the streets of New York, and snatched, as it was supposed, from the dangers which surrounded them. A considerable number, as I was informed, had been committed to the school through the agency of one of our most active protective societies. As I stood amid the little victims a conviction of the crudeness and ignorance which mark so many of our attempts at benevolence penetrated me. Here was a mass of little sufferers gathered from the scenes of squalor and neglect in a great city, committed to a school in which their interests, physical and religious, were supposed to be protected, but in which there was an absence of those things which were essential to their bodily health and safety. Several conditions existed in this school, favorable to the development of the horrid epidemic.

1. Imperfect quarantine.
2. Bad, or insufficient lavatories.
3. Overcrowding.
4. Bad food.
5. Bad drainage.

The mere presence of such disease in a school, or reformatory, is censurable. If it gets into, or originates there it is a serious reflection upon its management. If it spreads, it shows that the internal police of the establishment is bad. Every candidate for admission to a residential public school, or school dormitory, should be examined by an expert to ascertain whether he has a communicable eye disease. Especially should this be done in schools and reformatories maintained for the good of the poor and degraded, since it is largely among these classes that communicable eye diseases prevail. There should be a competent medical officer at the reception quarters of every such school, capable of turning the eyelids of candidates and ascertaining whether they have catarrhal affections.

It may not be possible, or wise, to turn back into society, cases of communicable eye disease, as they may have been committed for vagrancy or other good cause. Moreover, it is better that such cases should be kept where they may be skillfully treated, and thus so isolated as to cease to be the sources of dangerous contagion. Every school and reformatory should have ample provision in the form of wooden shanties or tents and play-grounds to safely treat such cases till they shall have been carried beyond the point at which they cease to be foci of disease for others.

But as these diseases, so fatal to vision, may in spite of all available caution get into the schools and become endemic, we must insist that their known causes be, so far as possible, guarded against. It is certainly competent for the State to enforce the rules which would reduce the risk of such communicable diseases occurring in all schools and reformatories that draw any portion of their maintenance from the State treasury, or exist under a State charter.

Let us, then, consider the conditions which favor the introduction into, and prevalence in, a school of such communicable eye diseases.

1. The conditions which lead to the introduction of the communicable catarrhal eye disease into a school or reformatory.

A child is taken by an agent of * * * or some other representative of law or philanthropy, and with more or less haste is run through the judicial mill and committed to a school or reformatory. If such a child has catarrhal disease of the eyes, or granular lids, the chances are that it will become a vehicle of contagion to the school. If such a child had small-pox, it would not be let loose to spread the malady in a school; and yet that disease would be comparatively harmless in a school in which vaccination had been properly done. But there is no such protection against catarrhal or purulent eye disease. The lesson, then, is that the safety of children in such institutions demands that a proper examination be made of every child before he is admitted to see whether he has catarrhal eye disease, that he may, if the disease exists, be so domiciled as not to communicate it to others.

Furthermore, as the disease may originate in a school from overcrowding and bad food, the committing parties should see to it that children are not sent to institutions in excess of their sanitary accommodations, nurses and other resources.

If a child cannot be provided in an institution with a thousand cubic feet of air in the dormitories and class rooms, and be guaranteed, also, abundance of milk and facilities for being pursed and kept clean, then it is better that it be allowed to run in the streets, getting, at least, the physical benefit of the "wild ass," till caught by the beau-

tiful hand of the Children's Aid Society or the Industrial Schools, and sent off to the West and into rural life.

2. We would now consider briefly causes which lead to the spreading of catarrhal eye diseases in such schools or reformatories.

- a. *Imperfect quarantine.*
- b. *Bad lavatories.*
- c. *Overcrowding.*
- d. *Bad food.*
- e. *Bad drainage.*

a. *Imperfect Quarantine.*—We have already alluded to the necessity for examining carefully the eyes of children sent to residential schools and reformatories. This would of course involve more knowledge and care on the part of those who gather the children and commit them to the institutions. It would also involve proper provisions within such institutions, for the isolation and treatment of those who enter them with communicable ophthalmia. It is eminently *improper* to have what are commonly called ophthalmic wards of the conventional type. Such places are very defective, and tend to develop an atmosphere which soon saturates walls and furniture and to beget disgusting hospitalism. I saw, some time ago, such a night ward in a garret where the inmates had less than one hundred and seventy cubic feet of air each. Wilde, in his tract, alludes to the fact that in the epidemics referred to, the disease seemed to be reproduced most freely *at night*, and no doubt from the effects of overcrowding bad air and actual contact of individuals.

These cases should be treated, except during the coldest weather, in tents, or throughout the year in wooden shanties raised above the ground by underpinning, and with ample rooms to enable the children, so isolated from the entirely healthy inmates, to have such instruction and amusements as may be necessary for their best moral and physical interests. They should have the largest amount of out-of-door life to improve their tissue building, as defective tissue building is at the bottom of chronic ophthalmia. A healthy child getting catarrhal conjunctivitis will, as a rule, make it self limiting, and throw off the malady without any incorrigible tissue lesion if its nutritive processes are not degraded by bad hygiene.

b. *Bad Lavatories.*—It has been and still is the practice in some schools and reformatories, to have insufficient or badly arranged lavatories. The children are allowed to rush in masses into damp and reeking basements, where they wash in common. The process of washing is too often a mere smearing of the face or a rubbing of dirt

into the eyes, and then a chance grab at an omnibus-towel. In many schools and reformatories this evil has been lessened, but in very few of them has the matter of careful, separate ablutions been duly provided for. Every child should have its own place for washing, with due privacy and adequate attendance and an individual towel. Cases of "chronic sore eyes" should have distinct arrangements and ample provision made that the eyes may be gently, but thoroughly cleansed, at least twice a day, and the edges of the lids properly annointed to prevent the accumulations of secretions among the eyelashes, from which they so readily get to the eyes of others. The local treatment of the acute cases does not properly fall to be considered in this paper.

c. *Overcrowding*.—Of all the causes mentioned, it is not easy to estimate which is the worst. All sanitarians will, however, agree that overcrowding is a most fertile cause and aggravation of sickness in every variety. It is probably the most common and, therefore, the most universally damaging. *Crowd poison is a most subtle and most fatal poison.* Alcohol and syphilis produce results which attract more attention because some of them are very phenomenal, but they do not work the mischief which the presence in the atmosphere of invisible human filth does. It constantly poisons the blood of the sufferer, and *insidiously undermines his tissue-building* by day and by night.

Moreover, crowding makes it impossible to guard the sufferers against contagion and the rapid transportation of polluting secretions from a diseased eye to a well one. Flies and other insects become the conveyors of the contagium, and should be destroyed by the use of all the available traps and other means. *Light should not be excluded for this purpose, as that would enfeeble the children, and degrade their tissue-building and make the destructive effects of the disease greater.*

d. *Bad Food*.—What we have said of the effects of bad air applies in a measure also to bad food. The quality and quantity of the air supplied are closely related to the food supply. Indeed, the air we breathe is, in a very important sense, a food, or blood-making element. If the health of children in a public institution is largely due to the quantity and quality of the air which they have supplied to them, it is also very largely determined by the extent to which *milk* forms the basis of their dietary. Let children in schools and reformatories have a thousand cubic feet of air space, each, by day and by night, and all the good bread and milk that they can be made to eat and there will be insured comparatively good health. It is now as it always has been, that the badly fed are the first to fall victims to ophthalmia. I have

read the tract of the late Sir W. R. Wilde, entitled "Observations on the Epidemic Ophthalmia, which has prevailed in the work-houses and schools of the Tipperary and Athlone unions, Dublin, 1851." In this tract great stress is laid on the relations existing between the disease and filth and starvation. He says, "the class of patients attacked were debilitated, starved female children, generally those recently admitted, worn out by previous want and privation of every kind."

e. *Bad Drainage*.—This is also a fertile cause of ill-health in public institutions. Not that we can yet safely attribute special diseases to particular germs, and say that they came up out of a sewer and seized a child by the eye or throat, and produced such and such a disease. But sewer air and polluted ground-air vitiate the atmosphere and render it unsuitable for purposes of respiration and tissue-building. The annual reports of all public institutions should contain a certificate from an expert setting forth the known condition of their water supply and sewerage, and an effort should be made to so construct all lines of drains, that they may be in sight within the buildings, and easily overhauled outside of them at the time of annual scrutiny, and report.

The children gathered in our State schools and reformatories are largely drawn from the homes of our Irish fellow-citizens, and seem to be peculiarly liable to destructive or chronic affections of the conjunctiva. It must be remembered, however, that the catarrhal affection on which we are writing is very communicable, and may be easily imported into any school. A single case in a school, if not isolated, is like leaven. If the sanitary conditions of the schools are good, it may not find congenial soil, or become rooted, or spread. If, however, the school is badly lighted, damp and overcrowded, and the dietary deficient in animal food; if the dormitories are crowded and the arrangements for the daily ablutions insufficient, or the basins and towels for congregate or promiscuous use, and the drainage bad, then we may expect evil to follow. I found, even in the hospital dormitory of the school to which I first referred, less than two hundred cubic feet of air per inmate, and the atmosphere loaded with impurities.

It is with great pleasure that I say to the credit of the medical man in attendance that he had only recently been called to the charge of the school, and that he was instituting reforms with intelligence, and as rapidly as the nature of the establishment would allow.

I advised that tents should immediately be set up in the fields near by, and the sufferers scattered beneath their shelter, assuring the non-medical officers of the school that the much dreaded light and air would only have a salutary effect. I also insisted with the doctor upon the

freest use of milk in the dietary, and it was increased in quantity from fifteen to four hundred quarts. The subject seems to be of such importance that I here give a note just received from the medical man in charge, refraining, of course, from publishing either his name or that of the institution referred to, as my object in writing this paper is to do good, and not to make a sensational point against any one, or to stigmatize those whom I intend quietly to help to do better things than they are now enabled by their present knowledge and economic resources to accomplish :

December 28th, 1881.

“DR. C. R. AGNEW:

“DEAR SIR—In compliance with your request I herewith send you a statement of the condition in which I found the institution in question. I was first called April 1, 1881. A strong odor of sewer gas pervaded the building, which proceeded from several foul and entirely unventilated pan water closets, the soil pipe from which emptied by means of a leaking sewer, which was also without trap or ventilator, into an adjoining privy vault, the discharge being entirely below the water line. No fresh air was admitted to the soil pipe or sewer. The kitchen and laundry waste was discharged upon the surface of the ground, *the latter under its floor*. The institution contained 308 children crowded together in close, unventilated rooms, sunlight and air being rigidly excluded. In one sleeping apartment *above* the laundry these children were placed two and three in a bed with *less than one hundred and twenty-five* cubic feet of air apiece, the windows and blind being closed. Fortunately no water closets had been placed here, but two tin slop pails, placed in the center of the room, were used instead. The food was of poor quality. I believe but ten (10) quarts of milk were furnished daily. Two troughs sixteen (16) feet in length answered for a lavatory, all washing in the same water, while the few towels in use were employed indiscriminately. Sore heads were almost universal, dependent principally on the vermin inhabiting them. The itch was also very prevalent. I subsequently learned that several children had died from *cerebro-spinal meningitis*. Forty-eight (48) Children and attendants were suffering from fully developed purulent conjunctivitis. Perforation of one cornea had already taken place in three (3) cases, of both cornea in one (1) case. *Six cases had been removed to hospital. Of these, three (3) lost both eyes. Three (3) lost one eye, each.* The disease had prevailed the preceding year, just how extensively, I was unable to ascertain ; but the institution still contained five (5) children who had lost both eyes, and seventeen (17) who had lost one (1), each at that time.

"Of the remaining children scarcely one could be said to possess a healthy conjunctiva. Between the months of April and September, since when no new cases have appeared, I treated among the inmates 129 cases of severe purulent conjunctivitis which ran their full courses, and 114 of a milder type. I this day examined 111 of those who passed through the same form with reference to the condition in which the conjunctiva has been left.

22 had healthy lids.

56 granular lids.

33 chronic conjunctivitis.

"Many of the latter have hypertrophoid papillae, and I think that when they subside the granulations will appear. Except the cases before mentioned, but one (1) child had perforation of the cornea. Under the directions of an experienced sanitary engineer, all of the old closets, plumbing and sewers were removed, new means of drainage introduced, and the premises placed in as good a sanitary condition as our present knowledge will allow. Finding it impossible to quarantine the great number of cases, the children were all placed in tents, where they remained throughout the summer and autumn. They were given as much good cows milk as they could use. Great care was exercised that no child used another's basin, towel, comb, etc. Under the influence of fresh air and good food the disease soon disappeared.

"Yours, &c., &c."

The occurrence of an epidemic of purulent ophthalmia not only produces cases of partial or entire blindness, but spoils the integrity of the lining of the eyelids. This latter condition of proliferation or thickening of the conjunctiva of the eyelids, and production of so called granulations is a most obstinate and incorrigible affection. It leads in very many cases to a life of troublesome eyes, to cloudy cornea and imperfect sight, or ultimately ulcerations, staphyloma, and possibly destruction of one or both eyes.

The bad effects of this preventable malady are not confined to the limited school life, but run through the entire career of the sufferer or make him a vehicle of contagion to others. I have often seen an entire family inoculated by the arrival in their midst of a case from a public institution. I have seen it carried into a community and there spread by a child discharged from such a school. It will be seen that we have not only the acute malady to deal with, but the baleful after effects, in blindness, chronic eye trouble and the spread of catarrhal eye disease in tenements and other communities. The authorities then, and those who make the reduction of the expenses of public char-

ities the special object of their zeal should become broader students of the matters they undertake to regulate. "There is that scattereth and yet increaseth, there is that withholdeth and yet tendeth to poverty." It would be easy to stamp out ophthalmia in public schools, if all who are interested would work in unison. We have so many societies to do charitable work, and so much pulling at cross purposes to catch each other, and to get sensational points for mutual recrimination, and so much tendency to use raw facts for temporary or selfish our political purposes that one sometimes almost despairs of ever seeing a wise and generous economy introduced. I think that schools and reformatories should be licensed by the State under a general law like that, for instance, determining the capacity of emigrant ships so that overcrowding and bad food would be impossible without a misdemeanor on the part of their managers. The license should state in terms what cubic air space must be secured for each inmate and what the dietary must be. Then no school or reformatory would have more inmates than the building should contain or its resources properly maintain, and societies for inquiry and advice would have some definite duties to perform with reference to them. The law should fix a minimum of eight hundred or one thousand cubic feet of air space for every such inmate, and at least one quart and a half of good milk, of definite purity, besides other specified food for each inmate and also determine methods of applying the principles for drainage and ventilation and out of door work and amusements.

All over our State there are schools in which the effects of overcrowding and insufficient food and other preventable causes of disease are telling disastrously upon the health of their inmates, and so are seminaries, or seed places, from which legions of children go out to recruit the ranks of long-lived paupers. There are also, as I well know near this city, New York, institutions against which I make no complaint and I purposely avoid any injudicious criticisms or comparisons.

REPORT OF STANDING COMMITTEE ON QUARANTINE, EXTERNAL AND INTERNAL.

The first known maritime quarantine regulations were adopted by Venice in the year 1448, then at the height of her commercial and political prosperity; since that time almost every civilized government has, from time to time, resorted to measures which restrained the commercial and social intercourse of its citizens, in order to prevent the introduction and propagation of infectious and contagious diseases. The necessity of sanitary regulations and quarantine restrictions among communities was recognized in ancient, as well as modern, times. Sanitary work as preventive measures seems to have largely taken the place of curative agencies among the ancient Jews; physicians, or persons devoted to the medical art, were unknown; the priesthood discharged such offices as a part of their religious duties. "All the days wherein the plague shall be in him, he shall be defiled; he is unclean; he shall dwell alone; without the camp shall his habitation be."—Levit., 13-46.

The laws for the cleansing of persons, their perfect isolation when suffering from contagious diseases, the relentless destruction of everything that communicated infection or contagion, adopted and executed under the wonderful system established by the Jewish lawgiver, may justly excite the admiration of modern sanitarians. The most eminent statesmen and jurists of our own age and country, have approved the restrictive measures necessary for the protection of the public health.

"Health and quarantine laws have been continually passed by the State since the adoption of the constitution," says Chief Justice Taney. "and the power to pass them recognized by acts of Congress, and the revenue officer of the general government directed to assist in their execution."

The character of the restrictions has differed as widely as the diseases against which they have sought to guard. The earlier medical observers, believing in personal contagion as the source of propagation of this class of diseases, directed preventive measures, chiefly to the inhibition of communication with the diseased, or those who had been exposed to the contagion supposed to arise from them. The history of epidemics in so far as relates to their progress from one community and country to another, gives some reason for this belief; for their march is along the great highways of human intercourse—some over continental spaces, while others make their approach by the sea. The embarrassments to commerce which attend the imposition of quarantine restrictions is principally experienced at the maritime approaches to our great cities.

The cities of the eastern continent have, for ages, established a *cordon sanitaire* against those fearful pestilences known as plague and cholera, while the cities of the western world have sought, by quarantine restrictions, established at the entrance to our ports, to guard with equal vigilance against that disease, which for a long period has been naturalized in many of the islands of the West Indies, known as yellow fever. It was with special reference to yellow fever and small-pox that the earliest legislation in the nature of a quarantine act was passed by the colonial legislature of the province of New York, in the year 1755.

Numerous acts of the council previous to that time attest the anxiety and efforts of the authorities to prevent the introduction of the disease mentioned. Not only were restraints imposed, and penalties decreed for their violation, but solemn fasts were proclaimed "to divert Almighty God's present and impending judgments." Notwithstanding these, the city of New York and adjacent localities were almost yearly visited by epidemics of yellow fever, during the latter part of the last, and the early part of the present century. Seventeen invasions of the disease are reported to have been suffered previous to 1811, notwithstanding the enactments of councils and legislatures, and the prayers of the people.

That these might have been, and, with the aid of the sanitary knowledge of to-day, would have been arrested, the history of the New York Quarantine conclusively proves.

The opportunities for the admission of infectious diseases into the city, through the great waterway of the port, have been vastly increased since the time when yellow fever was an annual visitor there. Its commerce has increased a thousand fold, and its proximity to the home of the pestilence has been nearer, through the rapid transit afforded by steam vessels. It may be truthfully asserted that no other port in the world is more exposed to the approach of pestilential diseases than the port of New York. The extent of its commercial relations; the short time occupied in the passage of steamships from the tropical haunts of yellow fever, and the immense number of immigrants entering the city from all quarters of the globe, combine to make it the most exposed of the great highways of ocean commerce.

Populous cities environ the port, from which radiate arteries of commerce and travel through a vast territorial area, distributing the wealth and population of an empire.

The vigilance of the quarantine at the port of New York, which prevents the admission of infectious or contagious disease into New York city, guards not only the health of the immediate vicinity, but in a measure shields the cities, villages and remotest hamlets of a continent.

Less important, but worthy of consideration is the influence of its quarantine, directly or indirectly, upon the material prosperity of a considerable portion of the people at the seaboard, and thence through established commercial relations with millions in the interior. An epidemic of contagious or infectious disease in the commercial metropolis, like the lesion of a great nerve centre, arrests the influence of the creative power, and paralyzes every member with which it is connected. And to carry the figure still further, the flow of commercial intercourse, like the vital current returning from the paralyzed extremities, is tardy in movement and insufficient in quality and quantity, to invigorate and restore the original prosperity of the one, or the health of the other. The

diseases against which quarantines are established, are public enemies which not only sacrifice human life and health, but cripple every industry.

Thus, owing to the annual epidemic of yellow fever which prevails at Havana and other ports of the West Indies, commerce is greatly restricted during a portion of the year, and the population reduced by the hegira of unacclimated residents. The embargo which disease lays upon the commercial prosperity of New Orleans may be instanced as an example of its effects in our own country. Some of the regular steamship lines are withdrawn from that port during the active quarantine season, between May and October; and a great number of sailing vessels that trade to New Orleans at other seasons of the year, during this period seek other and more healthy ports.

The extent of the disastrous influence which yellow fever may cause in this country, was illustrated by the epidemic of 1878, when 20,000 people were its victims, and 120,000 persons were stricken with it. The magnitude of the financial loss in this one epidemic can scarcely be estimated. Reference to this disease is made because it particularly illustrates the necessity and value of an efficient maritime quarantine. It has passed beyond the limits of argument into the realm of demonstration that this disease may be wholly arrested in its approach to our shores by a vigilant quarantine along the seaboard.

Under certain circumstances the operations of quarantine may, and should be not only unobtrusive, but unseen by the public. It is better, when the tidal movement of a great epidemic, such as has frequently approached the very threshold of the city of New York, and has been quietly arrested and confined to the limits of the quarantine hospital, that the public should have no opportunity to indulge unnecessary apprehensions.

The history of the New York quarantine is one of growth. It commenced at a period when scarcely more than the rudiments of sanitary science were understood; when contagion and infection were little comprehended, and were often confused in the minds of medical observers, and when the measures which were employed to arrest disease, became the means of its extension to other victims.

The idea of personal contagion was so established in the minds of medical men at the beginning of the present century, that the instructive lessons which should have been taught by each of the rapidly succeeding epidemics of yellow fever were of no avail. It seems for a long time not to have occurred to the health authorities of the port and city that the cause existed, and grew by propagation entirely independent of personal contact or communication.

The quarantine law of 1811 required that "all vessels with yellow fever or any other pestilential disease on board, or hailing from ports where yellow fever prevailed, should discharge cargo in quarantine," and *to remain in quarantine thirty days*. And all passengers and sailors on such vessels were detained *for twenty days* after the last exposure to such disease. Considered by the light of modern sanitary laws, no better plan could have been devised to perpetuate the disease among the unfortunate passengers and crew, than their detention for twenty days on an infected ship, or one on which the imperfect process of disinfection was in progress. It was not until 1830, that the law allowed

healthy persons in vessels from infected ports to go to the city on arrival. The law required that infected vessels should be "washed in vinegar and white-washed three times."

The epidemic of yellow fever which prevailed in New York in 1822 first developed at the foot of Rector street, and was alleged to have come from one or the other, or both, of two vessels or their cargoes from Havana, named *Spanish Soldier* and *Eliza Jane*.

Other evidence exists showing that another vessel, which had introduced yellow fever from Key West to St. Augustine, lay at the Rector street dock, and several of the persons employed on the vessel were among the first to suffer from the disease. The origin and development of the epidemic gave evidence of the still insufficient measures which were practiced in the cleansing and disinfection of vessels.

The progress of the disease at this invasion is interesting, and affords lessons in the etiology of the disease by which the medical observers of the times and their successors to the present time have profited. Early in July, the first case was developed. Steadily, but slowly, the infection advanced along the street toward Broadway. The street was barricaded; the barriers were extended, and the infection spread correspondingly. Families living on the street were warned of the approach of the infection and advised to remove within a certain period; many fled, and others unheeding the danger, or hesitating too long, became victims. One other centre of infection seems to have been established in Mulberry street during the epidemic, but it was limited in its area and effect. With this exception, the five hundred cases which occurred, many in other parts of the city, were traceable to contact with the infected district.

The law which required "all vessels with yellow fever, or any other pestilential disease on board; or hailing from ports where yellow fever prevailed," to quarantine thirty days, was in direct violation of principles which at the present time are recognized as the most successful in the administration of quarantine.

Its immediate result was great embarrassment to commercial interests, and its secondary effect was the transmission of disease from one vessel to another, and to the people on adjacent shores.

During the epidemic of yellow fever, which prevailed in 1856, upward of two hundred vessels were at one time under quarantine restrictions, and anchored between the Narrows and Robbin's reef. It is not surprising that the population of both shores of the bay of New York, were at this time decimated by the pestilence.

With this brief glance at the New York Quarantine as it has been, it will not be improper to consider its present methods for securing not only to New York city, and its populous environs, but as well to the far and near populations of the interior, first, the utmost possible exemption from contagious and infectious disease, and second, the least embarrassment to its great commerce and immense passenger travel, consistent with the desired protection from disease.

For nearly twenty-five years last past yellow fever has obtained no serious foothold by admission through the port of New York. Every year during that period it has sought admission in numerous instances, and in different ways; sometimes through the stricken victim and his infected baggage or clothing; oftener lurking in the darkness of the hold, or the filth of the bilge.

Since the occupation of the present quarantine hospital, now twelve years, nearly four hundred cases of yellow fever have been arrested at the threshold of the port, and provided for at the Quarantine Hospital. The head boards at Seguine's Point number 286; a large majority of which mark the resting place of its victims. The number of cases of small-pox discovered during these years, assuming that the past two years furnish a basis for an average for the last twelve, has been 1,248, which were removed from 648 incoming vessels.

The exposure of New York to infectious and contagious diseases through its relation to the tropical ports, and the vast emigration passing through it, has been referred to. But the local conditions which favor the propagation of infectious disease when once established, have not been considered. At a time when partisan interests are seeking to magnify the unsanitary conditions referred to, it may not be wise to make more than a passing allusion to these. The comparatively high death rate of this city, at the present time (35⁸⁰/₁₀₀ in the last quarter of the present year) renders its degradation marked, in the health scales of the great cities of the world.

The fault is not so much in the officials who represent the interests of the people at the Board of Health, nor is it to any considerable extent chargeable to the condition of the streets. The cause is beyond this, and dates to the defective system of drainage adopted in the early history of the city.

In many of the older portions of New York there are no adequate sewer connections; if these ever existed, their connections with the main sewer have become defective to such an extent, that in some instances the sewage never reaches them. The occupants of every boarding-house, hotel, or other domicile in this condition, is in danger from disease; waste material and excrementitious matter saturate the soil, until foul gas freighted with disease-producing germs fills the air, which, instead of giving renewed vitality and vigor to human life, impregnate the people with the elements of disease and death. But it is in the condition of the wharves and docks, decaying wooden structures and accumulated filth in adjacent streets, that infection germs would find a congenial home. Dr. Sternberg, surgeon U. S. A., in his recent highly interesting and instructive "Experimental Investigations relating to the Etiology of Malarial Fevers," says: "The fact observed by myself, that during the summer months the mud in the gutters of New Orleans possesses an extraordinary degree of virulence, shows that pathogenic varieties of bacteria are not alone bred in the bodies of living animals. The more I study this subject, the more probable it seems to me that in this direction lies the explanation of many problems which have puzzled epidemiologists, and that the sanitarians are right in fighting against filth as a prime factor in the production of epidemics—a factor of which the *role* is easily understood if correct."

The extent of the shore line occupied by wharves within the city limits of New York and Brooklyn, is nearly twenty-four miles. Much of this distance under favorable circumstances, such as moisture, and a prolonged summer temperature, would supply conditions well adapted to the rapid propagation of infectious germs. It is not in improved sanitary conditions alone that these cities must look for safety from infectious and contagious diseases, that almost daily during a portion

of the year seek admission in one form or another; but in the systematic and efficient management of the quarantine that sits at the gateway of their ocean commerce.

If, during a period of a *quarter of a century*, the methods and measures which are adopted in the administration of the New York quarantine have not only prevented the introduction of any epidemic of contagious or infectious disease, and instead of being as formerly, a grievous embarrassment, have been able to lighten the burdens of commerce, it is fair to assume that a vigilant and judicious exercise of the same means will secure results in the future equally satisfactory in the protection of life, health, and material interests.

The law which required that vessels with disease on board, or hailing from ports where yellow fever prevails, should quarantine thirty days, and all passengers and sailors on board such vessels be detained twelve days, was repealed by the statute of 1830, so far as to allow passengers to go to the city without baggage, but subject to the discretion of the health officer.

Chapter three hundred and fifty-eight of the laws of 1863, declares that, "if a vessel, though not having had during the voyage any case of quarantinable disease, yet be found in a condition which the health officer shall deem dangerous to the public health, the vessel and cargo shall be detained until the case shall have been considered; the decision of the health officer, however, in all such cases shall be rendered within twenty-four hours. Vessels in an unhealthy state shall not be allowed *pratique* until they shall have broken out, duly cleansed and ventilated." The provisions are essentially the same, except that the health officer is made the judge of the time necessary for the detention of vessels. This power was exercised by the health officer during the epidemic of 1856 with terrible results. Vessels were closely anchored, and frequently cabled together all the way from the narrows to the discharging anchorage between Robbin's reef and Bedloe's Island. Infected vessels thus detained without discharge of cargo, exposed to the influences of accumulated filth, and a high temperature, became pest ships, which distributed the infection to passing vessels, and the adjacent shores.

To whom the credit of inaugurating the change in quarantine management is due, which secured the prompt discharge of the cargoes from vessels, and the early separation of passengers and crew, there is some doubt. It is certain that there were quarantine officials who entered protest.

Doctor Elisha Harris, late "physician-in-chief" at quarantine, in reply to inquiries addressed by the quarantine commission in 1858, and transmitted to the governor, March 10, 1858, declared that "the accumulation of a large amount of infected materials without complete ventilation, or the close aggregation of a large number of infected vessels with their cargoes, in the absence of other ventilation than that attainable on shipboard, would, during any of the summer months, constitute a *pest embankment*, dangerous to all persons and vessels coming in near proximity thereto. * * * And the fewer the vessels that remain at the quarantine anchorage, the better for the public safety, as well as for the interests of commerce."

It is quite probable that the terrible lesson, taught by the management of quarantine during the epidemic of 1856, was remembered, and that it influenced the change in no inconsiderable degree.

The appointment of Doctor S. O. Vanderpoel as health officer in 1872, was signalized by other changes which still farther relieved the burden which quarantine imposed without increasing the exposure of the port to the introduction of disease. One of the principal of these was the admission of lightered goods from the quarantined vessels directly to the warehouse of the consignee or owner, without the expense of storage at an intermediate warehouse. This relief from the additional expense incurred in removal, and the excessive charges which the monopoly stimulated, was greatly appreciated by the shipping merchants.

Slowly under the teachings of experience, the management of quarantine emerged from the cloud of imperfect measures, which in the early part of the century were productive of unsatisfactory, and, sometimes disastrous results through the admission of infectious disease to the city, which sometimes assumed epidemic proportions, to the adoption of a system which has thus far secured absolute protection from the invasion of yellow fever, and so far as possible through the action of the quarantine officials of the port, from other quarantinable diseases, and without any considerable embarrassment to the travel or commerce entering the port.

Vessels from infected ports, or with the suspicion of infection, arising from sickness on board, while at or in transit from the port of departure, are immediately discharged of cargo, cleaned and disinfected. It is evident that the disease-producing germ once destroyed, there is as little danger from propagation of the disease in twelve hours thereafter, as in twelve days. The measures adopted to secure this result were stated with some detail, in a communication published in the report of the New York State Board of Health for 1880. A brief extract from that article will be proper.

"If there is sickness of a suspicious character, the sick are removed to the quarantine hospital. If the ship is less than five days from a port infected with yellow fever, passengers and vessel are held until that period has fully elapsed. In the meantime the hatches are opened, the cargo and stowage are fumigated twice, at intervals of several hours, with chlorine or sulphurous acid gas.

"All baggage, mails, and whatever articles liable to have become infected are put in a close apartment and submitted to disinfection by the agents mentioned. This done, the master of the vessel is given the annexed form of 'permit,' and directed to the discharging anchorage in the upper bay, distant three miles from the city:

Permits will be issued by the health officer on this blank.

PORT OF NEW YORK.

The _____ from _____ Quarantine _____ 188
is permitted to proceed to quarantine anchorage, between Robin's Reef lighthouse and Bedloe's Island, and discharge cargo on lighters, subject to accompanying regulations.

When discharged, the captain is directed to report to the health officer on Staten Island.

..... Health Officer.

The pilot is directed to anchor this vessel out of the track of ferry boats and away from the ship channel. In case of failure or neglect to do this, the vessel will be required to move before she is permitted to discharge.

"Here, under the constant supervision of the quarantine police, and the frequent visitation of the health officer, the most perfect system of cleanliness is enforced.

"The exposure of the cargo to air in its transit to the dock, serves still further to remove the danger of infection. There is no instance of the propagation of disease from that source in the history of quarantine at the port of New York. The cargo removed, the hold is now thoroughly washed, and in the case of sailing vessels the 'limber-streaks' along the keelson taken up, accumulations of filth removed, and the air spaces washed down, until the water returns clear of any evidence of impurity.

"A solution of sulphate of iron, of the strength above indicated, is now used, with which to scrub and rinse the entire hold, inclusive of the 'air spaces' and 'limber streaks.' Finally, from fifty to one hundred pounds of sulphur, according to the size of the vessel, are burned under the hatches, which are closely covered.

"The ship's crew is now mustered, and examined as they pass before the health officer. If all are well the vessel is allowed to proceed to her dock without further delay. It is proper to remark that in vessels suspected of yellow fever infection, the crew is not allowed to discharge cargo, or if they do, are submitted to a quarantine of observation for five or six days.

"It is difficult to discover how the disinfection could be more thorough, or the sanitary condition more satisfactory by a longer delay than sufficient to accomplish the results mentioned."

While the fullest protection from imported infection is secured by these means, the interests of shipping merchants are disturbed to a very limited extent. Steamships of 2,000 tons are discharged of cargo by lighters, the vessel cleaned, disinfected and restored to commerce within two or three days after arrival at the discharging anchorage.

If the year 1880 affords a basis for a fair average, and it is believed it does, the number of vessels examined between May 1st and November 1st at the New York quarantine during the last ten years from ports subject to yellow fever, is 9,880.

The number of sick on these vessels at the port of departure, during the passage, to New York, and at quarantine for the same period, is 1,640.

Report of Lower Quarantine for 1881.

INFECTED PORTS.	No. of vessels arriving from infected ports.	No. of vessels arriving with sickness.	NUMBER OF SICK.			NUMBER OF DEATHS			Remarks.
			In port of departure.	On the passage to New York.	In Quarantine.	In port of departure.	On the passage to New York.	In Quarantine.	
Angostura.....	3	2	1	2	..	1	1	..	
Bahia.....	3	3	..	..	..	..	..	..
Barbadoes.....	25	..	..	..	..	..	..	..
Cienfuegos.....	8	3	6	1	..	2	1	..	
Cardenas.....	8	..	..	..	..	..	..	..
Curacao.....	5	..	..	..	..	..	..	..
Demerara.....	10	2	..	4	2	..	3	..	
Guadeloupe.....	15	..	..	..	..	..	..	..
Havana.....	88	14	19	8	5	6	3	3	
Matanzas.....	9	..	..	..	..	..	..	..
Martinique.....	13	1	..	1	..	..	1	..	
Nuevitas.....	6	1	1	..	..	1	..	..
Laguna, Mex....	4	1	..	2	..	..	1	..	
Pernambuco.....	9	..	..	..	..	..	..	..
Para.....	5	..	..	..	..	..	..	..
Rio Janeiro.....	16	3	5	..	..	3	..	..
Santa Cruz.....	4	3	21	..	..	5	..	..
Santiago de Cuba	24	1	..	5	1	..	3	..	
Sagua-la-Grande.	11	..	..	..	..	..	..	..
Trinidad (Isle)..	9	..	..	..	..	..	..	..
Vera Cruz.....	15	3	..	3	..	..	2	..	
	290	37	53	26	8	18	15	3	

No. of vessels discharged in Quarantine in 1881	Total No. of vessels examined between June 15, and November 1, 1881 from Ports subject to yellow fever.....	608
Steamships.....	21	
Ships.....	1	
Barks.....	15	
Brigs.....	9	
Schooners.....	3	
Total.....	49	
Number vessels from Havana.....	88	

Report of Lower Quarantine for 1880.

INFECTED PORTS.	No. of vessels arriving from infected ports.	No. of vessels arriving with sickness.	NUMBER OF SICK.		NUMBER OF DEATHS.		Remarks.	
			In port of departure.	On the passage to New York.	In Quarantine.	In port of departure.	On the passage to New York.	In Quarantine.
Antiqua	3	1	2	..	..	1	..	..
Aspinwall.....	20	5	..	19	11	..	4	4
Aquin.....	3	2	2	7	..	..	2	..
Barranquilla....	2	1	1	..	..	10	..	..
Bahia.....	23	5	16	..	..	..	1	..
Havana.....	86	11	15	1	14	..	..	5
Matanzas.....	21	..	..	..	..	..	..	..
Nassau.....	8	..	..	..	..	..	..	..
Nuevitas.....	3	..	..	..	..	..	..	..
Pernambuco	21	1	..	1	..	..	1	..
Port de Paix....	7	5	15	12	1	1	5	..
Point a Pitre, Guadalupe.....	10	1	..	1	..	..	1	..
Rio Janeiro.....	46	9	29	6	..	7	2	..
Santos.....	11	1	5	..	..	3	..	..
Santiago de Cuba	11	1	..	1	..	..	1	..
Sagua-la-Grande.	10	1	..	..	1	..	..	..
San Domingo city	2	2	2	1	..	..	1	..
Vera Cruz.....	4	1	..	1	..	..	1	..
Curacao.....	1	1	..	..	..	..	..	1
	292	48	87	50	27	22	19	10

No. of vessels discharged in quarantine 1880: Total number of vessels examined from Steamships..... 26 ports subject to yellow fever, between May 15th and November 1st, 1880 968
 Ships..... 1
 Barks..... 19
 Brigs..... 23
 Schooners..... 8

Total..... 77

"Rigid rules as to the length of quarantine," "fixed by legislative enactment," have been advocated as a remedy for the varying fancies of Boards of Health, and political resolutions which influence the appointment of health officers. It is not improbable that the commercial community would be protected with greater certainty from oppression by unscrupulous officials, by means of laws which prescribe a certain time for the operations connected with quarantine. Nevertheless, the wisdom of such laws is questionable. Under the direction of an intelligent and faithful officer, protection of the public health is better secured by leaving much to his discretion and judgment. Flexibility in the administration of quarantine rules and regulations often enable the quarantinist to lighten the burdens they impose. When yellow fever

prevails at Sagua-la-Grande, (Cuba), upon the proximity of the disease to the wharves, depends the decision whether or not vessels shall discharge in quarantine. Although cases of this disease were reported to this office throughout the past summer, no vessels of many that arrived from that port were required to discharge in quarantine. The distance from the town in which the cases occurred, to the wharves where vessels receive their cargoes, was sufficient to exempt them in the opinion of the health officer at New York, from the necessity of any detention except for disinfection of cargo.

It is not until the disease has assumed epidemic proportions at Havana, and invaded the wharves and shipping, that the danger-line is considered to have been reached, and vessels are required to perform all the duties of a rigid quarantine. The time when this condition obtains, varies greatly in different years. The annexed tables will demonstrate this difference; the relief which may be afforded under the varying circumstances and extent of the development of the disease, vary accordingly.

The number of vessels entering the port from Havana in 1880 and 1881 during the season is very nearly the same.

The number of sick of yellow fever in quarantine in 1880 was somewhat more than three times the number in 1881. The total number of vessels that discharged in quarantine was less in 1881, by nearly the same ratio. The existence of yellow fever at a port is not necessarily a reason for the enforcement of all the rules and regulations of quarantine against such a port. Has the disease taken on an epidemic character, and the infection invaded the wharves or shipping of a port, are questions, the answers to which will influence the decision, and govern the disposition of vessels by the intelligent quarantinist with equal safety to the public health, and greater benefits to commercial interests, than adherence to fixed rules established by law. The treatment of the vessel, whose crew or passengers have had sickness at the port of departure or on the passage, is regulated by the history of the cases of sickness, and the condition of the vessel. The vessel on arrival being in good sanitary condition, and satisfactory evidence being given that the sickness commenced in each and every case within five or six days after leaving port, and that the sick were probably infected by communication with the shore, the vessel would be likely to obtain *pratique* after the disinfection of her cargo.

Laws which secure the right of a quarantine officer to impose restrictions, and which protect him in the exercise of such duties as experience has demonstrated are necessary, leaving much to his judgment, will contribute more to the protection of both the health and wealth of the people, than laws which do not admit of the exercise of discretion in their administration.

Yellow fever has prevailed much less than usual in the West Indies during the past summer. Nine hundred and sixty-eight vessels were examined from ports subject to yellow fever in 1880, and five hundred and ninety-six in 1881. One hundred and thirty-seven cases occurred in port or on the passage in the former, and seventy-nine cases in the latter year. The New York quarantine has been exceptionally free from the disease during the present year. The same causes doubtless, which have limited its development in its usual habitats, have contributed

to prevent its introduction into the United States. Key West has the unenviable distinction of being the only locality in which it has developed.

Small-pox has, for reasons that will be noticed, come to be the most difficult and vexatious problem with which the quarantine authorities at the port of New York have to deal.

Early in the administration of the present health officer at the port of New York, the "human flood," that in unparalleled measure was deluging the country with the surplus population of the Old World, became a source of anxiety and apprehension that diseases of a contagious character in a latent condition would find their way through the maritime quarantines of the United States to the populations of the interior. Under this impression a circular letter, dated May 20, 1880, was addressed to the health authorities at the principal distributing points for immigrants in this country, reminding them that however great the vigilance of the authorities at the seaboard, the germs of disease were liable to pass such points undeveloped, and appear in the immigrant at some stopping place or distributing point in the "far west," and advising that a systematic inspection of immigrants should be undertaken at all the great centres of emigrant travel such as Buffalo, Suspension Bridge, Chicago, Pittsburgh, St. Louis, Red Wing, Omaha, Montreal, etc.

Foci for the epidemic development of the disease were manifest in several European ports of departure for immigrants, during the latter part of 1880. The comparatively long incubative period which attends the development of the contagion of small-pox, the rapid transit from ports of the Old World, the enormous proportions which immigration assumed early this year, and which gave every indication of continuing for an indefinite period, increased the concern felt by the quarantine authorities at New York.

Unlike yellow fever, whose incubative period rarely exceeds five days compelling scarcely twenty-four hours' detention of steamships at this port to complete the period which proclaims the safety of passengers, small-pox requires fourteen days for the development of the eruptive stage; four to six days longer than the average passage of steamships from European ports to New York. The immigration to the United States through this port has assumed such proportions during 1880 and 1881, that the detention of passengers of all vessels with immigrants until the completion of the incubative period, as in cases of the passenger steamships from ports infected with yellow fever, would not unfrequently result in the accumulation of ten thousand immigrants at the quarantine.

Statistics of the immigration to the United States in the last sixty years, and particularly during the past two years, are essential to a consideration of the measures necessary for the protection of the public health from such diseases as usually accompany the immigrant.

If the present hegira from the Old World to the New, is but a transient condition — the result of causes which will of necessity cease speedily, and that may not exist again for an indefinite period, it would not be so important, and for that reason less obligatory on the legislator, the philanthropist, or the sanitarian, to make laws and frame "Rules and Regulations" to prevent the admission through our maritime quarantines of diseases of an infectious and contagious character.

If, however, economic, political and territorial conditions, have made immigration to this country a probability in the future, to any such extent as in the past, legislation must be made so complete that the quarantinist will have power to compel the necessary vigilance and care on the part of owners and managers of passenger steamship lines, and the officers of ships at the port of departure, and on the passage to this port by the imposition of such restrictions at quarantine as will secure the desired result.

Within the last sixty-one years eleven millions of alien passengers have landed on our shores.

Much embarrassment is experienced from time to time during the warm season, by the character of consular and other bills of health from infected ports. In June of 1880 the governor of the Bahamas issued a proclamation declaring them infected with yellow fever. But long after reliable information had reached this Department from other sources that yellow fever prevailed at Nassau, clean bills of health from that port were issued by the consul.

August 22nd, 1880, the consul at Point-a-Pietre, Guadeloupe, declared "that the number of deaths from yellow fever far exceeded the number reported;" and that "the authorities try to suppress all information on the subject." These plain and honest declarations were as exceptional as they were instructive, and in marked contrast to the course of the consul at Martinique who, it is asserted, gave clean bills of health, long after the British consul refused to give clean bills on account of the prevalence of yellow fever at that port.

Many cases of yellow fever occurred at Key West in 1880, before the health authorities at that port acknowledged its existence in bills of health. Well marked cases of yellow fever were taken from vessels entering this port in more than one instance, during the past summer, when consular declarations were invoked by interested parties at this port to prove that the disease did not exist at the port of departure; but subsequently conclusive evidence of its existence was secured.

The conclusion has been fully established from many instances, such as have been referred to, that consular agents are too frequently influenced by commercial or other interests at the place of their official residence, to act independently in this matter. Ignorance of the actual state of the public health, from concealment by the health authorities, undoubtedly contribute to make these occurrences more frequent.

The extensive commerce now existing between ports in which yellow fever is endemic, and the numerous ports in our own country within the yellow fever zone, demands on the part of our national representatives at ports where this disease exists, or where it is liable to occur, the utmost vigilance and conscientiousness in their reports through bills of health or otherwise.

The National Board of Health has rendered good service in correcting this difficulty at Havana. Its paid representative at that port, a physician of reputation, fills up bills of health, and the consul general certifies to the fact. This arrangement has given entire satisfaction at this port. It is to be earnestly hoped that the co-operation of the State Department at Washington will be given to enable the National Board to introduce its forms of bills of health in every port liable to be infected with yellow fever.

It is scarcely to be expected that the National Board, with only

limited financial resources, can establish medical representatives at even the principal ports of the West Indies. From consular agents, therefore, in the future, as in the past, must be obtained the only representation available for the guidance of the officers at quarantine, as to the health of the ports to which they are accredited.

The general government, through the secretary of state, has endeavored to correct this evil by urging upon consuls the necessity of a careful consideration of the character and extent of diseases prevalent within their official jurisdiction, and a conscientiously faithful representation through bills of health, of the facts in relation to contagious or infectious diseases in their locality.

The number of cases of yellow fever admitted to hospital by no means represents the extent of the danger. Should the restrictions of quarantine be relaxed or abandoned, there would be much greater inattention to sanitary conditions on vessels from infected ports, and there is little doubt that the communication of the officers and men of such vessels with the shore, would be so much greater that the sickness and consequent exposure at the port of destination would be greatly increased. The hope on the part of ship's officers of escaping detention at quarantine, by attention to hygienic conditions and restricted intercourse while at infected ports, contributes in a considerable degree to diminish the number of cases of sickness. In numerous instances vessels that touch regularly at several ports in the West Indies, during the less dangerous season, refuse to take cargo at such ports when infected, and are thus saved the detention and expense at quarantine, which it would be necessary to subject them to under other circumstances.

The cases of typho-malarial fever arriving on vessels from Port de Paix and other ports in the tropics, were particularly severe in 1880.

The bark *Treci Dubrovacki* arrived at lower quarantine from Port de Paix, with logwood, June 24th, 1880. Soon after leaving for New York (June 4th and 5th), two of her crew were taken sick, but recovered. June 6th, another seaman was taken sick and died the 10th of the same month. On the last mentioned date, six others were taken, and were sick when the vessel arrived. June 15th, the captain sickened and died the day before reaching port. There was no record of the date when others were taken sick, as the mate and a boy were all that remained able to do duty. Eleven men were sent to the quarantine hospital, of whom three died, one being moribund when admitted. Two of the crew had died on the passage. In a crew of fifteen "all told," all had been or were sick on arrival, and one-third of the number died.

September 18th, the bark *Erinagh*, from one of the ports of Hayti, navigated by ten men when she left that port, arrived at lower quarantine in tow of the steamship *City of Washington*. This vessel had eight men sick on the passage, two of whom died before reaching port. Four men and one boy were sent to hospital on arrival. When picked up by the *City of Washington*, the *Erinagh* was in a helpless condition in mid-ocean for want of well men to navigate her.

The condition of these vessels was extremely filthy. The malarial influences of this pestilential locality was superadded to the effects of the ill-conditioned cargo, and the crowded, badly ventilated and terribly foul fore-castle in which sick and well were huddled together.

The brig *Oliver Cutts*, with logwood, navigated by nine men, arrived July 2d. Seven men were sick on the passage; one of whom had died

at sea ; four were removed to hospital the day of arrival, and two others on the following day.

August 6th, the schooner *A. J. Fabens* entered quarantine from Port de Paix, navigated by seven men. The captain, mate and steward were sick, and were sent to hospital. On the 7th, two seamen were also removed to hospital. The condition of the *Oliver Cutts* and *A. J. Fabens* was much more cleanly than the other vessels to which reference has been made, and the cases of fever were proportionally mild in their course and fortunate in results.

The sickness on these vessels has been referred to to call attention to facts which are well known to quarantine officials, and often not a little embarrassing. Fever of this type, as also that which is known as pernicious fever, have many symptoms during the initial stages, in common with yellow fever. And as these cases usually come from localities in which yellow fever frequently occurs, or prevails as an epidemic, their admission to the city would occasion much alarm. Particularly when, as has occurred during the past season, yellow fever has been removed from the same vessel with cases of malarial and typho-malarial fever. However confident the medical officers at quarantine may be that the case is not yellow fever, it is a wise precaution, for reasons stated, to send these cases to the quarantine hospital for observation and treatment.

The cases which are designated as typho-malarial have different morbid elements which unite to produce the type mentioned. First, the "malarial" poison, whatever that may be, generally received among the marshes and low lands which border many of the ports in a tropical or semi-tropical climate, and perpetuated by the ill-condition of the cargo. The logwood and other woods which frequently constitute the cargo is usually dragged through the water some distance and stowed under the hatches thoroughly saturated with water. Second, the dietetic deficiency which often exists among seamen; and third, the insufficiently ventilated, crowded, and filthy condition of the fore-castle.

The malarial element in these cases is doubtless the original cause, and the typhoid condition which gives most of the cases a serious aspect, and frequently fatal result, is the consequence of unsanitary conditions. Except those cases which entered the hospital moribund, or desperately ill, all with one exception recovered under the use of quinine, the moderate use of stimulants and a liberal supply of nourishment.

In 1821 the total number of immigrants that came to the United States was 17,512. With few exceptions, every year since has shown a marked increase, until it reached, in 1880, 673,636. Of this number 327,371 passed through the port of New York.

In the communication read at a meeting of the State Board of Health at Niagara Falls, August 11 and 12 last, the writer stated that "during the first five months of the present year (1881) 181,749 immigrants passed the New York quarantine," and that, "should the rate of immigration continue for the balance of the year, the enormous number of 400,188 will have landed at Castle Garden alone."

The estimate made falls short of the number by many thousands. During the year 1881, 441,307 steerage and 58,331 cabin passengers arrived at this port.

The mind fails, unaided by comparison, to comprehend the territorial extent of our country, and its capacity for the reception of an immi-

grant population. Its circumference, exclusive of Alaska, is 11,000 miles. In area it embraces 3,611,849 square miles. Its population, according to the census of 1880, is 50,000,000. The population according to these figures is $13\frac{8}{10}$ to the square mile. Compare this with France, and the difference is striking.

The continental area of the French Republic is 203,811 square miles — its population in round numbers is 40,000,000 giving $196\frac{8}{10}$ persons to the square mile.

The United States may multiply its present population by fourteen, and not increase its density beyond that of the French Republic at the present time. It is fair to assume that the boundless prairies of the west and north-west, the still abounding primeval forests that fringe the great lakes and crown the slopes of mountain ranges, the exhaustless mines of the Rocky mountains, "the visions of gold" in yet comparatively unknown territories, will continue to invite the immigrant for many years to come, to leave his home among the crowded populations, and the grinding political and social conditions of European governments, for the generous hospitality and princely advantages which the great American Republic offers.

The current of immigration, if not uniform, since 1820, has steadily increased to its present unparalleled proportions. A vast army without banners invades the country yearly. The cause cannot depend on accidental conditions, on some great upheaval in the political status of the nations of the Old World, or on the surplusage of population in European communities. Neither one nor all of these fully explain the causes upon which immigration to the United States depends.

Immigration, to an extent that has hitherto been unknown in the history of the world, must be considered as an established factor in the problem of our national life. Its results will not only be felt on the civilization of our age, but on its public health and wealth as well. It will be expedient therefore to lay broadly and speedily the foundation on which these may rest, by such sanitary legislation as will best secure the desired result. There is no question connected with sanitary science at the present time of greater importance to the people of the United States than the prevention of the introduction of contagious and infectious diseases through the maritime quarantines of the country. Of these diseases, small-pox at the present time gives rise to far the greatest apprehension, and demands the most immediate consideration of measures to arrest its introduction and propagation.

It has become evident that the remedy must go beyond the quarantine of arrival and reach the immigrant at the port of departure. No laws can be made by the authorities of this country which will be recognized there. It is only by imposing restrictions at quarantine in the United States, in case of the omission to take such measures for the protection of immigrants at the port of embarkation, or during the voyage, and to exercise such vigilance as will protect the well from disease, that a remedy can be secured.

The resistance which in several instances during the present year has attended the effort to vaccinate immigrant passengers at the New York quarantine, who had been exposed to the contagion of small-pox during the passage, has deterred the authorities from any attempt to compel the vaccination of unprotected immigrants, without evidence of exposure, there being no law, rule or regulation having the force of law, to author-

ize the procedure. But the right-royal welcome extended to immigrants through the laws of the United States demands in return from them a cheerful compliance with such laws as are necessary equally for the protection of the public and themselves.

Impressed with the fact that vaccination of passengers at quarantine who had become infected previous to embarking, or from exposure to the disease, during the early part of the passage, would not prevent the development of the disease, though it might modify its severity, an appeal was made through the following communication published in the *New York Tribune* and *New York Herald*, for greater vigilance and active co-operation on the part of officers of passenger steamships at the port of departure and en route to this port.

“QUARANTINE, S. I., May 27, 1881.

“*To Owners and Agents of Steamship Passenger Lines:—*

“In the interest of the great cities that environ the port of New York and of interior communities, constituting a population of millions of people, the undersigned considers it his duty to call the attention of the owners and agents of the passenger lines of steamships entering the port of New York to the following facts:

“The immigration at this time from European and English ports to the United States is unparalleled in its history. In many of the ports of departure, small-pox is prevailing to an unusual extent. In consequence of the great number of immigrants who are often waiting at these ports for passage, who, from circumstances, are compelled to seek immigrant lodging-houses in the most unhealthy and infectious portions of the city at the port of departure, small-pox on board the passenger steamers on arrival at this port has been in the last four months unprecedentedly frequent.

“The cases which are developed on or before arrival at this port constitute but a small portion of the unfortunate results consequent on the extensive infection of emigrants at the port of departure. The incubative period of small-pox—fourteen days—is so much less than the average passage of steamships from many of the European and English ports to New York, that there is great danger of the disease developing far in the interior of the country. It will be apparent that no amount of vigilance at the port of New York can prevent this result, since the infected immigrant passes quarantine perfectly well. It is of importance, therefore, that the civil authorities in these ports employ every available means to prevent the infection of immigrants, and arrest the propagation of the disease. Much may be done toward securing this result by a systematic, thorough and frequent examination of immigrant lodging-houses. A careful inspection by competent medical officers, of every immigrant, and the vaccination of all unprotected persons, will do much to accomplish this object. In the absence of either power or inclination on the part of the constituted authorities to do this, the owners and agents of steamship lines should take it into their own hands, to inspect, direct and control the movements of immigrant passengers from the time of their arrival at the port, until their departure. Under the present management it is believed that thousands of lives are imperiled and many sacrificed. These, though by far the greatest, are not the only evils which proper precautions would avert.

Passengers, except the sick who were sent to the hospital, were removed to Hoffman's Island for observation, during the usual incubation period of the disease.

"Notwithstanding the serious inconvenience to all, and the great expense to the owners, this alternative is far better than the admission of a cargo of infected immigrants to the dense population of our cities, and the crowded thoroughfares of the interior.

"Better than either would be such watchfulness and vigilance on the part of medical officers, as would secure early and complete isolation of the sick in such hospitals as would afford sufficient ventilation and comfort to the sick, and opportunity for the complete seclusion of real or suspected cases of contagious disease. Hospitals should be upon the main deck — never in the crowded steerage. When this is impracticable, they should be so located as to include port lights for light and ventilation, instead of a coop or pen hastily built between decks, and in the midst of the steerage, with ventilators which allow the escape of the infectious atmosphere surrounding the patient among the steerage passengers. Such violations of hygiene and common sense will in future be likely to subject all passengers to quarantine of observation, who may be so unfortunate as to have taken passage on steamships having small-pox on board, and provided with such hospital accommodations as have been described.

"Twice daily it should be the duty of the medical officer to visit and inspect every part of the steerage, that all cases may be detected and immediately isolated. Satisfactory evidence of this will save the owners of passenger vessels much time and expense, commercial interests in general not a little embarrassment, and the undersigned trouble and anxiety which he would be happy to escape.

"WM. M. SMITH,
"Health Officer, port of New York."

When eight or ten days of incubation are given the infection, though not sufficient to develop the disease to medical officers at quarantine, the time is nevertheless long enough to put it beyond the controlling influence of vaccination. No law, State or national, could be made obligatory upon the authorities from which the immigrant embarks; and no law or ordinance existed which would authorize a quarantine officer at any port in the United States, to arrest and detain a passenger vessel for any purpose, except to ascertain whether or not quarantinable diseases existed on board. The appeal referred to, it was hoped, would stimulate the managers and owners to a system of sanitary supervision of the resorts of immigrants at the port of departure, a medical inspection of all immigrants when they embark, and the vaccination of all unprotected persons soon after they came on board. A faithful discharge of these duties, it was believed, would reduce the importation of the disease to a minimum degree, and obviate the necessity of more restrictive measures through State or national legislation.

There were many reasons to believe that infected immigrants in whom the disease was latent, were frequently passing quarantine, and proceeding toward their destination in the interior of the country, establishing a focus of infection whenever they were overtaken by the disease, or distributing the contagion along the line of travel, until the severity of

the disease, or the accidental discovery of it by the authorities, arrested their further progress.

Impressed with this conviction, and the necessity of a careful inspection of all immigrants at the main distributing points in the interior, as also their supervision by the local health authorities for a short time after arrival, of those who stop temporarily or otherwise along the route, the following article was published in the principal New York papers, copies of which were transmitted to many of the health authorities in our Western States.

HEALTH OFFICER'S DEPARTMENT, STATE OF NEW YORK, }
QUARANTINE, S. I., June 3, 1881. }

To Health Authorities:

The unparalleled tide of immigration which is now flowing from the British Islands and Continental Europe to the United States, principally through the port of New York, in connection with the ascertained fact that small-pox prevails to an unusual extent at the present time in some of those countries, and at many of the ports from which emigrants embark, early created a well-grounded apprehension on the part of the health officer at the port of New York that this disease would be developed along the great highways of travel, or at the great interior foci of emigrants who have passed New York, Boston, Baltimore or Philadelphia quarantines in good health. Emigrant passenger steamships entering the port of New York with cases of small-pox in the steerage that have not been early and properly isolated, have in several instances within the last four months, been compelled to discharge their passengers at the "quarantine of observation" to await the development of vaccination or the full expiration of the incubative period of the disease. When the medical officers of steamships are able to give satisfactory evidence that cases of small-pox occurring during the passage have been properly isolated from the initial stage of development, the passengers are vaccinated, the vessel is disinfected and given pratique. It is not of necessity the emigrants on these vessels only, though quarantined, who communicate the disease to interior communities, the greater source of danger is in those who have been infected at, or even previous to, arrival at the port of departure, and reach this country previous to the period of the development of the disease. It will be apparent that the utmost vigilance on the part of quarantine officers cannot prevent the introduction of the contagion in this latent condition.

Telegraphic communication with the health authorities of the great cities through which the currents of emigration pass, notifying them of the arrival of vessels with small-pox, has been suggested as a measure which would contribute to secure early detection of those cases which develop subsequent to their passing the port quarantine.

It must be remembered that emigrants on landing immediately mingle with those that arrive on other vessels, often several thousand in number, and are frequently forwarded to their destination over the same line and upon the same train. Hence, such information would be of little practical benefit, except to secure greater vigilance in such inspection as would be proper, and indeed may be a necessity in every instance. Detention of all emigrants at the port of arrival until the expiration of the incubative period, has also been suggested as a means of

preventing the introduction of the contagion into the country. When it is considered that, the number of emigrants arriving at the port of New York is, often, for successive days, several thousand, the impracticability of this expedient will be apparent. The accumulation would quickly be such that no adequate accommodations at the New York quarantine could be supplied, notwithstanding the unequalled extent and convenience of the buildings upon the artificial islands which the State has already provided for "quarantine of observation."

Experience and much earnest consideration of the subject during the past year have confirmed the opinion that a careful inspection of all emigrants at certain points west of the quarantine is essential for the protection of the country from the introduction of this form of contagious disease. Buffalo, Pittsburg, Chicago, St. Louis, Omaha, and perhaps other places, are foci where the municipal or State authorities may with great advantage establish an inspection of all emigrants. In the absence of such action on the part of the authorities referred to, the National Board of Health, it is believed, has authority under its reserved powers for the regulation of inter-State quarantines to secure the desired inspection at such distributing centers as may be necessary for the protection of adjacent States. Buffalo and Suspension Bridge in this State may be mentioned as illustrating the proper localities for such inspection. At intermediate localities, like Utica, Syracuse, Rochester, Elmira and Hornellsville, the authorities, it is hoped, will establish a careful inspection, and for a short period maintain a close supervision of all emigrants who arrive.

If this management is practiced by the health authorities along the great thoroughfares westward of the Atlantic seaboard, it is confidently believed that the introduction of contagious disease through infected emigrants will be effectually prevented. An increasing vigilance on the part of the quarantine authorities at this port may be expected, and it is to be hoped the same will be exercised at all the maritime quarantines through which emigrants pass.

WILLIAM M. SMITH,
Health Officer, Port of New York.

The New York State Board of Health recognized the danger at its meeting held on the 23d of June, 1881, and unanimously adopted the following resolutions:

"Whereas, It is believed that small-pox is at the present time prevailing in some of the ports of the British Islands and of Continental Europe; and

Whereas, The emigration from those countries to the United States, principally through the port of New York, is at the present time unprecedented in its extent; and recognizing the fact that the incubative period of the disease is greater than the average passage of steamships from such ports to ports in the United States, thus affording an opportunity for emigrants infected at the port of departure to pass our quarantines and reach interior communities before the development of the disease;

Resolved, That this Board request the National Board of Health, as a necessary measure of inter-State quarantine, to appoint an Inspector of Emigrants at Buffalo and Suspension Bridge, whose duty it shall be to

examine all emigrants passing through or stopping off at the place mentioned.

And this Board further respectfully recommend that the National Board of Health establish such inspections at Chicago, Pittsburgh, St. Louis and Omaha, during the epidemic prevalence of small-pox at the ports from which emigrants embark."

Thirty vessels with small-pox entered the port of New York within the first six months of the present year, freighted with upward of twenty-two thousand alien passengers, as against seven vessels during the corresponding period of 1880, with 4029 passengers.

This fact alone was sufficient cause for serious apprehension; and when considered in connection with the fact that in various ports of the United States outbreaks of small-pox were occurring with increasing frequency, particularly in the large cities of the North and West, as well as in more rural towns and villages in many States, additional measures to prevent the introduction of the disease demanded consideration. It had become evident that unless local authorities at ports of embarkation, or the owners of passenger lines, could be induced to act with greater efficiency, legislation would, and should be invoked so restrictive in its character as to compel their co-operation.

With the hope of impressing upon the managers of passenger lines at the port of New York the necessity for the examination of all immigrants immediately after they are received on board the vessel, and the vaccination of all that are insufficiently protected, a conference with the agents of most of the lines was had on the twenty-ninth of June, 1880.

At this conference the necessities and demands of the public through their representatives at the State and National Quarantines, the State and National Boards of Health, as well as the local health authorities in the interior, were clearly presented. The measures recommended for their adoption were:

1. Inspection of immigrants to discover those unprotected by vaccination.

2. The vaccination of all unprotected persons.

3. The supply of good and sufficient hospital accommodations to enable the medical officers of steamships to establish perfect isolation of developed cases of contagious disease separately from suspected cases, and from non-contagious diseases.

The conference was informed that in obedience to the necessity for protection of the lives and health of the people, and the demands of public sentiment, the National Board of Health would be likely to exercise its reserved powers, and require that all vessels, whose officers fail to make such inspection and vaccination or revaccination of unprotected passengers, should be quarantined or the passengers detained for a sufficient time to insure the development of all undeveloped cases of small-pox.

In this connection, it is proper to bear in mind that the port of New York, though the principal, is but one of several ports of entry for emigrants to the United States, and that the precautions necessary at that port are as necessary at all other such ports, in the ratio that the number of arrivals bear to those at New York. Port Huron on Lake Michigan is second only to New York in the number of aliens that pass through it into the United States. No inspection of immigrants is made

at this point, notwithstanding the well known fact that the Canadian provinces, particularly those lying in the line of travel for immigrants landing at Quebec, have been for two years past suffering from many outbreaks of small-pox, notably at Montreal.

The number of vessels "entering foreign" that were boarded and inspected during the year 1880, was 7827.

The number of foreign entries inspected in 1881 was 6929.

The number of immigrant passengers passing inspected at the New York quarantine in 1880 was 327,371.

The vessels entering the port with small-pox in 1880 were from the following ports:

Antwerp.....	5	Naples.....	3
Hamburgh.....	3	Liverpool.....	1
Bremen.....	2		
			<hr/>
			14
			<hr/>

Number of cases of small-pox on vessels in 1880 — 26.

The vessels entering with small-pox in 1881 were from the following ports:

Liverpool... ..	10	Antwerp.....	4
London.....	5	Bremen.....	4
Havana.....	3	Bordeaux.....	1
Hamburgh.....	6	Perth Amboy.....	1
Glasgow... ..	4	Naples.....	1
Havre.....	1		
			<hr/>
			40
			<hr/>

Number of cases on vessels in 1881, 78. Number of emigrants on vessels with small-pox, 34,416.

The treatment of vessels having small-pox in the steerage, has been as different as the circumstances attending the development and management of the several cases.

When satisfactory evidence is given that the case has been detected in the initial stage, and properly isolated, the steerage passengers are vaccinated, the vessel disinfected and pratique is given. In several instances where neglect on the part of the medical officers of the vessel had subjected the passengers to exposure to infection, they were detained in quarantine until the protective influence of vaccination was secured, or until the incubative period had elapsed.

The steamship *Italia* arrived at quarantine, December 19th, 1880, from Naples, and ports on the Mediterranean with 749 steerage passengers, mostly Italians. Two cases of small-pox were found in the steerage. One of these was confluent in type, and isolated chiefly through the helplessness of the victim. One corner in an angle of the steerage formed by the termination of a gangway, in an open bunk, adjoining a space between rows of bunks, along which the other passengers passed without restriction, constituted the hospital. The other, a well developed case (*variola discreta*), was in the fifth or sixth day of the eruption, but was not seen by the medical officer of the steamer, until discovered by the health officer at quarantine, while examining the passengers in detail.

There could be no reasonable doubt that many of the passengers had been infected by the neglect or stupidity of the physician of the vessel. Both passengers and crew were immediately vaccinated, and the passengers removed to Hoffman's Island for observation. The fifth day after vaccination, examination was made of every passenger; in three hundred and forty-five cases the vaccina gave evidence of satisfactory results. Those in which its effect were not evident, were revaccinated.

On the ninth day, the fourth of the revaccination, the 404 in which the first vaccination gave negative results, were again examined; 147 showed promising results from the second vaccination. In 207 of those in which both vaccinations failed, there were good cicatrices from previous vaccination, or evidence of having had small-pox. These cases were believed to be protected sufficiently, and, with those in which the results of vaccination were satisfactory, were sent to Castle Garden. Fifty persons in whom vaccination had not been productive of desired results, and whose evidences of previous protection were unsatisfactory, were detained until the full incubative period elapsed.

Among those in whom, on the fifth day, vaccination seemed to be progressing favorably, two cases of varioloid developed, the seventh day after vaccination. Instances of this character have been so frequent as to afford satisfactory proof that the incubation of the infective principle of small-pox will not be arrested in its development after the third or fourth day of its incubation, though it may be modified in its character.

April 24th, 1881, the steamship *Victoria*, from London, arrived at quarantine with 925 steerage passengers. This vessel had one case of small-pox, and one of typhus; both cases were properly isolated. The case of small-pox, then in the third day of the eruption, was not detected by the ship's medical officer, until the eruption appeared. One hundred and fifty of the passengers refused to be vaccinated. After all but these had been vaccinated and sent between decks, all persuasion failing, forcible conclusions were tried with the rebellious. In the midst of great violence twelve or fifteen of the leaders of the malcontents were seized and forcibly removed to the steamboat *Gov. Fenton*, for transportation to the quarantine of observation. The remainder made haste to find the medical officers to be vaccinated.

All but two of those put aboard the *Fenton* quickly expressed their desire to be vaccinated, and were allowed to be. The two were permitted to indulge their will at Hoffman's Island fourteen days.

The *Assyrian Monarch* arrived at quarantine, April 28th, 1881 from London, with 581 steerage passengers and 86 crew. Six cases of small-pox were found on board, and were sent to hospital.

The cases had been so promptly isolated as they developed, that it was not considered necessary to detain the vessel only time enough to vaccinate the passengers and crew. Twenty-five of the firemen, however, refused to submit to vaccination. It was nearly night, and the ship was detained with the intention of removing the unvaccinated in the morning to Hoffman's Island. The following morning, all but five of those that refused, came forward and were vaccinated. The rebellious were taken to Hoffman's Island for observation.

May 7th, the eighth day after removal to the quarantine of observation, one of the five was taken sick with what proved to be a severe at-

tack of small-pox. Before the full incubative period elapsed, the four remaining members of the *Assyrian Monarch's* crew were put aboard of that vessel on her passage down the bay on the return voyage to London.

The *State of Nevada* arrived at quarantine, May 19th, 1881, from Glasgow, with 825 steerage passengers, six of whom had small-pox, varying in the eruptive stage of development from one to four days.

The most severe case had been diagnosed as varicella by the medical officer in charge. The other cases were not discovered until the passengers passed for examination before the Health Officer. The gross neglect of the medical officer of the vessel was considered sufficient warrant for the detention of the passengers for observation.

They were vaccinated and immediately removed to Hoffman's Island. Detachments of those in whom vaccination had proceeded favorably for eight to ten days were sent to Castle Garden. Several cases of small-pox developed among the passengers while under observation, and were sent to the Riverside hospital.

June first, 1881, the steamship *Denmark* arrived from London, with 965 immigrants in the steerage. Four cases of small-pox, that had been early and judiciously isolated, were found on the *Denmark*. The small-pox cases were sent to the hospital for contagious diseases at Blackwell's Island; the passengers were vaccinated; three cases of measles that had been put in ship's hospital with small-pox cases, under the apprehension that they were cases of the same disease, were sent to hospital of observation for detention and disinfection of clothing and baggage; and after thorough disinfection of the hospitals, as in every other instance, pratique was given. June 15, 1881, the steamship *Wisconsin* arrived with twelve of her crew sick with small-pox. This unusual infection of a passenger steamship's crew came from a case among the crew of the vessel on the outbound passage; no precaution having been taken by the medical officer on board, to prevent the effect of the infection, by vaccination of the exposed persons.

The steamship *Britannic* with 592 passengers received at Liverpool, arrived June 19, 1881. One case of small-pox was found which had been discovered and isolated in the initial stage, by the ship's medical officer. After much persuasion, all the passengers except thirty-one were vaccinated. These, the declared adherents of anti-vaccination societies, were speedily installed at Hoffman's Island, with an assured leisure of fourteen days if not vaccinated within the first twenty-four hours after arrival.

The following day, twenty-seven reconsidered their pledges to the anti-vaccination society, were vaccinated, and sent to Castle Garden. The four remaining passengers distinguished themselves with true English obstinacy, remaining under observation the full period of fourteen days.

On the day of the arrival of the *Britannic* the steamship *City of Montreal* arrived at quarantine, having 1,242 immigrants in the steerage. One case *varioid* and one of *variola* were found, both of which, with commendable vigilance had been isolated judiciously the day before the appearance of the eruption. The case of varioid occurred in a German 43 years of age, who had a fair vaccinal scar, from vaccination six years before. The eruption was peculiar in being abundant, but abortive, and the base of each of the ten thousand imperfect pustules that

almost covered the surface was tinged with a hemorrhagic appearance. So marked was this feature of the case, that the ship's physician diagnosed it as typhus fever. The patient had but little evidence of constitutional disturbance.

Ole Nilsson, a Swede, was found on the steamship "*Furnessia*" June 26, 1881, complaining of general *malaise*, slight headache and pain in the back. The mucous membrane of the lip showed a few enlarged papillae; the case was ordered to be strictly isolated until examined the following day by a medical officer from Quarantine, with the expression of an opinion that it was a case of varioloid, and the vessel was given *pratique*. At the examination of the case the next morning, the suspicion of the day previous was confirmed, and the man was sent to hospital. This case illustrates the insidious character of the development in many cases. Had this man arrived at quarantine a few hours earlier, no human skill or vigilance could have found evidence upon which to have based a suspicion of his having been infected.

One of the finest passenger steamships that enters the port of New York, on her first trip was unfortunate in having a case of small-pox among the steerage passengers. Assurances were given by both the captain and medical officer, that the case had been isolated previous to the appearance of the eruption. A careful examination of the patient, through an interpreter, proved that the eruption had been developed two days before discovery and isolation. The vessel was consequently detained, the passengers vaccinated, and treated as in other instances of exposure to the contagion of small-pox.

The temptation on the part of officers of passenger steamships to deceive the quarantine officer is so great, that only incessant watchfulness and application to every source of information on his part, can prevent deception.

The Hamburg steamship "*Westphalia*," with 1,012 passengers in the steerage, came into quarantine December 22, 1881. The *Westphalia* left Hamburg December 8, touched at Queenstown the 12th, and received on board 400 passengers which the disabled steamer *Allemania* had landed there on the fourth of December. One case of small-pox had developed among the *Allemania's* passengers when they reached Queens-town. They were all vaccinated on the seventh of December.

On examination at quarantine, three-fourths of the vaccinations were found successful; many of those that had not taken, showed good evidence of protection from previous vaccination. Few were, however, revaccinated. The *Westphalia's* passengers taken at Hamburg were separated from those of the *Allemania's* throughout the voyage, but were vaccinated at Quarantine. The full incubative period after exposure to the infection from the case on the *Allemania* had passed, and the assured watchfulness and early isolation of the case on the *Westphalia* by the medical officer in charge of the *Allemania's* passengers, gave reason to believe that the contagion had not extended to other persons. Twenty-four hours before the appearance of the eruption the patient had been put in charge of a single attendant who was not allowed communication with parties outside of the patient's room. This attendant was sent to Hoffman's Island for disinfection and observation, the patient was removed to Riverside hospital, the vessel disinfected and *pratique* given.

The conference called by the State Board of Health of Illinois, of delegates from State and municipal Boards of Health to meet at Chicago the 29th of June last, to "consider and adopt measures for the united action of health authorities to prevent the introduction of small-pox into the United States, and prevent its spread from one State to another," declared that "an important factor in the importation and dissemination of small-pox is the rapidity of ocean transit" in connection with immigration. "That while the incubation period of small-pox is fourteen days, eight to twelve is the average period of the voyage of the immigrant vessel arriving at New York, where the greater number of immigrants land. It is a well ascertained fact that the immigrants reach the ports of embarkation commonly several days before the sailing of the ship." "During this interval the immigrants take lodging in the low lodging houses about the docks and wharves in which small-pox is prevalent. The result is that the unprotected immigrants become infected, and if they immediately embark they may not only reach the port of destination before the incubation period has passed, but may pass the quarantine in apparently perfect health. And, what is still more important, if such infected immigrants immediately on landing take passage on board the emigrant trains, as vast numbers do, they may reach the most distant settlements before the disease finally develops. It is quite plain that under these circumstances no amount of vigilance, in merely searching for the sick, can prevent the introduction and wide dissemination of small-pox in this country. And this conclusion has ten-fold more force when applied to the introduction of small-pox from the Dominion of Canada by means of immigrants."

The action of the Chicago conference was in many respects confirmatory of the conclusions of the health officer at New York as previously expressed in published communications to "Health Authorities," and "Owners and Managers of Passenger Lines," referred to on a preceding page.

The appeal of the conference to the National Board of Health to impose such restrictions at quarantine, as would "make obligatory upon steamship owners to cause a medical inspection of all immigrants when they embark, and vaccination of all persons found unprotected," happily supplemented that already made by the New York State Board of Health, and the health officer at New York. The recommendation to the National Board to consider the propriety of making, promulgating, and enforcing rules requiring the inspection at the port of arrival of every immigrant before landing, and of the vaccination of all persons not protected, seems to have resulted in the adoption of "Additional Rules and Regulations" by the National Board, which were approved by the President, November 14th, 1881. These revised rules, having the force of law in their administration at the maritime quarantines, may properly be introduced in this place.

Rules and Regulations for securing the best sanitary condition of vessels, including their cargoes, passengers, and crews, coming to the United States from any foreign port where any contagious or infectious disease exists.

[Prepared by the *National Board of Health*, in accordance with the provisions of an act approved June 2, 1879, entitled "An act to prevent the introduction of infectious or contagious diseases into the United States."]

EXPLANATIONS.

1. The object of the following rules and regulations is to prevent the introduction into the United States of "contagious or infectious diseases."

2. The following diseases are recognized as "contagious or infectious diseases," for the purposes of these rules and regulations, viz.: Asiatic cholera, yellow fever, plague, small-pox, typhus fever, and relapsing fever.

3. An "infected" port or place, in the sense of these rules, is a port or place at which either Asiatic cholera, yellow fever, plague, small-pox, relapsing fever, or typhus fever exists.

4. To secure the "best sanitary condition" of a vessel, the following points shall be observed by the owners, agents, or master of such vessel:

A. Exclusion from the vessel, as far as possible, of persons or things known or suspected to be infected.

B. Cleanliness, dryness and ventilation of the vessel, both preliminary to loading and during the voyage.

C. Disinfection — that is, the destruction or removal of the causes of disease — which includes measures of cleanliness, ventilation, fumigation, etc.

D. The crew shall not be allowed liberty on shore after nightfall in suspected localities. They shall not be allowed to sleep on deck except under awnings. The forecabin shall be well ventilated and kept dry. Both in port and at sea the bilge shall be pumped out each morning and evening, or more frequently, if necessary. The utmost cleanliness shall be observed at sea as well as in port. Each seaman shall have two suits of underclothing. The clothing and bedding shall be aired every clear day. In tropical climates the men shall be required to wash their persons and change their underclothing every evening after work, while in port, and each working suit shall be washed, dried, and aired, after a day's use. These regulations as to clothing, airing of bedding, and ventilation, shall, as far as possible, be observed at sea as well as in port.

Rules and Regulations.

1. All merchant ships and vessels sailing from a foreign port where contagious or infectious disease exists, for any port of the United States, must obtain from the consul, vice-consul, or other consular officer of the United States, at the port of departure, or from the medical officer — where such officer has been detailed by the president for that purpose — a bill of health in duplicate, which shall set forth the sanitary history of said vessel, and that it has in all respects complied with these rules and regulations.

2. No vessel shall have more than one bill of health; but if she touches at other ports on the passage, the fact and the condition of those ports as to the existence of contagious or infectious disease shall be indorsed upon the original bill of health by the consul, vice-consul, consular officer, or medical officer of the United States.

3. The bill of health shall be in the form appended.

No. —

FORM A.

PORT OF —

The United States of America — National Board of Health — Bill of Health.

I, — (the person charged to deliver the bill), at the port of —, do hereby state that the vessel hereinafter named, clears from this port under the following circumstances:

Name of vessel : —.	Nature (vessel of war, ship, schooner, etc.) : —.
Tonnage : —.	Guns : —.
Apartments for passengers, No. : —.	Where last from : —.
Destination : —.	Name of captain : —.
Name of medical officer (if any) : —.	Total number of crew : —.
Total number of passengers	Cargo : —.
1st cabin :—; 2d cabin :—; steerage :—.	

Vessel.

1. Sanitary history of the vessel : —.
2. Sanitary condition of vessel (before and after reception of cargo, with note of any decayed wood). Note disinfection of vessel : —.
3. Sanitary condition of cargo : —.
4. Sanitary condition of crew : —.
5. Sanitary condition of passengers : —.
6. Sanitary condition of clothing, food, water, air-space, and ventilation : —.

Port.

1. Sanitary condition of port and adjacent country—
 - a. Prevailing disease (if any) : —.
 - b. Number of cases of and deaths from yellow fever, Asiatic cholera, plague, small-pox, or typhus fever during the week preceding :

Number of cases of	Number of deaths from
Yellow fever : —.	Yellow fever : —.
Asiatic cholera : —.	Asiatic cholera : —.
Plague : —.	Plague : —.
Small-pox : —.	Small-pox : —.
Typhus fever :	Typhus fever : —.

- c. Population according to last census : —.
 - d. Total deaths from all causes during preceding month : —.
2. Any circumstances affecting the public health existing in the port of departure to be here stated : —.

I certify that I have personally inspected said vessel, and that the above statements are correct.

(Signature of Medical Officer.)

I certify that the foregoing statements are made by —, who has personally inspected said vessel; that I am satisfied that the said

statements are correct; and I do further certify that the said vessel leaves this port, bound for —, in —.

In witness whereof I have hereunto set my hand and the seal of office, at the port of —, this — day of —, 188—, — o'clock.

(Signature of Consul.)

4. Each consul, vice-consul, consular officer, or medical officer of the United States, in a foreign port, shall keep himself thoroughly acquainted with the sanitary condition of the port and its vicinity, especially with regard to the existence of contagious or infectious diseases, or epidemics, and shall, upon the request of the owner, agent, or master, make or cause to be made, an inspection of every ship or vessel bound to the United States, and give the bill of health required by these regulations. Vessels carrying a foreign flag shall be inspected, when practicable, in company with the consul or consular agent of the nation to which the vessel belongs.

5. The fee for such inspection shall be such as may be fixed by the secretary of the treasury.

6. The certifying authority at the port of departure shall certify whether vessels carrying passengers are provided with the means of carrying out the provisions of sections 4257 and 4263 of the revised statutes.

Sec. 4257. Every vessel so employed in transporting passengers between the United States and Europe, and having space according to law, for more than one hundred such passengers, shall have at least two ventilators to purify each apartment occupied by such passengers; one of which shall be inserted in the after part, and the other in the forward part of the apartment, and one of them shall have an exhausting cap to carry off the foul air, and the other a receiving cap to carry down the fresh air. Such ventilators shall have a capacity proportioned to the size of the apartments to be purified, viz., if the apartment will lawfully authorize the reception of 200 such passengers, the capacity of each such ventilator shall be equal to a tube of twelve inches diameter in the clear, and in proportion for larger or smaller apartments. All such ventilators shall rise at least four feet six inches above the upper deck of the vessel, and to be of the most approved form and construction. If it appears from the report to be made and approved, as provided in section forty-two hundred and seventy-two, that such vessel is equally well ventilated by any other means, such other means of ventilation shall be deemed to be a compliance with the provisions of this section.

Sec. 4263. The master of any vessel employed in transporting passengers between the United States and Europe is authorized to maintain good discipline and such habits of cleanliness among passengers as will tend to the preservation and promotion of health; and to that end he shall cause such regulations as he may adopt for this purpose to be posted up before sailing, on board such vessel, in a place accessible to such passengers, and shall keep the same so posted up during the voyage. Such master shall cause the apartments occupied by such passengers to be kept at all times in a clean, healthy state; and the owners of every such vessel so employed are required to construct the decks and all other parts of the apartments so that they can be thoroughly cleansed;

and also to provide a safe, convenient privy or water-closet, for the exclusive use of every one hundred such passengers. The master shall also, when the weather is such that the passengers can be mustered on deck with their bedding, and at such other times as he may deem necessary, cause the deck occupied by such passengers to be cleansed with chloride of lime, or some other equally efficient disinfecting agent. And for each neglect or violation of any of the provisions of this section, the master and owner of any such vessel shall be severally liable to the United States in a penalty of fifty dollars, to be recovered in any circuit or district court within the jurisdiction of which such vessel arrives or from which she is about to depart, or at any place where the owner or master may be found.

7. For the purpose of isolating the sick, especially those suffering from contagious or infectious diseases, every steamship or other passenger vessel shall have two compartments or space to be used as hospitals, one for the men and the other for women. These hospitals shall, when practicable, be constructed on the main deck, or on the deck next below the uppermost deck of the vessel.

8. Every vessel before taking on cargo or passengers shall be clean and dry, and the certifying officer may, at his discretion, require that it shall be thoroughly disinfected if last from an infected port, or if the port of departure be itself infected. The examination of the vessel as to cleanliness shall be made before the cargo is taken on, and shall extend to all accessible parts, especial care being taken to note upon the bill of health the presence of decayed wood.

9. Earth and porous stone shall not be used for ballast if avoidable.

10. Merchandise or articles known to be infected shall not be received or taken on board.

11. In case the port is infected, the certifying authority may require that the officers, crew, and passengers shall be examined by a medical officer or physician selected for that purpose, and the result reported to him not more than twenty-four hours before certifying to the bill of health.

If small-pox exists at the port, the certifying authority shall require that the medical examination above provided shall extend to all the passengers, as well as to the officers and crew, for the purpose of determining their protection against small-pox, and every person found unvaccinated, or not satisfactorily protected, shall be properly vaccinated before the vessel leaves the port, and a record of such vaccinations, including the name of each individual vaccinated, and the date of vaccination, shall be given to the master of the vessel to be by him delivered to the quarantine authority at the port of arrival.

12. Bills of health can be considered valid only when delivered within twenty-four hours last preceding departure. If the departure is delayed beyond this period the bill must be *vised* by the authority delivering it, stating whatever changes have taken place in the sanitary condition of the port, vessel, officers, crew or passengers.

13. When the port of departure or its vicinity is infected, that fact shall be noted in the bill of health, and when the sanitary or other local authority of the port declares the existence of such infection, the bill of health shall give the date of the declaration.

14. A port shall not be considered infected by reason of the existence

of contagious or infectious disease confined within the limits of the quarantine station of such port.

15. Physicians attached to sea-going vessels shall be specially charged with the duty of watching their sanitary condition and the health of their officers, crew and passengers. On arrival of the vessel they shall report to the health officer of the port the sanitary history of the voyage.

16. In case of the occurrence at sea of Asiatic cholera, yellow fever, plague, small-pox, relapsing fever, or typhus fever, the wearing apparel and bedding used by those affected with such disease shall be boiled for not less than two hours, or burnt or sunk.

17. Captains, owners, or agents of vessels shall, at the port of departure, be required to answer, under oath, to the consuls or sanitary officers all questions as to the sanitary condition of the vessel, etc.

18. Whenever any vessel shall leave an *infected* foreign port, or having on board goods or passengers coming from any place or district infected with Asiatic cholera, yellow fever, or plague, shall leave any foreign port bound for any port in the United States, the consul, consular officer, or other representative of the United States, at or near such port may, at his discretion immediately give information thereof by telegraph, to the National Board of Health, at Washington, D. C., reporting the name, date of departure, and the port of destination of such vessel. The cost of such telegrams will be paid by the National Board of Health.

19. All merchant ships or vessels from any foreign port where any contagious or infectious disease exists, and bound for any port of the United States, must present to the health officer at the quarantine station of such port, evidence that these rules and regulations have been complied with in order that such vessel may enter such port, discharge its cargo, and land its passengers.

J. L. CABELL,
President National Board of Health.

THOMAS J. TURNER,
Secretary National Board of Health.

OFFICE OF THE PRESIDENT OF THE UNITED STATES, }
November 14, 1881. }

The foregoing rules and regulations are hereby approved.

CHESTER A. ARTHUR.

Additional Rules and Regulations Necessary to prevent the introduction of small-pox into the United States from foreign Countries.

1. That all persons coming from or through any foreign port or place in which small-pox exists, who, after the 14th day of November, 1881, shall arrive at any port of entry within the United States, shall be subjected to examination as regards their protection from that disease, by the proper health authorities of the State within which such port lies, or in case such authorities shall fail or refuse to enforce this rule, then by some officer or other proper person, to be designated by the President of the United States.

2. That in case any person so arriving shall refuse to submit to such examination, or upon undergoing the same shall be found not sufficiently protected from small-pox, such person, and in case he or she be not

sui juris, then also the person having him or her under charge, shall be detained in quarantine until he or she shall have been properly vaccinated, or shall have passed the period of incubation from date of last exposure.

J. L. CABELL,
President National Board of Health.

THOMAS J. TURNER,
Secretary National Board of Health.

OFFICE OF THE PRESIDENT OF THE UNITED STATES, }
November 14, 1881.

The foregoing additional rules and regulations are hereby approved.

CHESTER A. ARTHUR.

It is a singular fact that the National Government has provided laws for the protection of the health of the immigrant, in regulating the quality of food, ventilation, and overcrowding of vessels, but has made no provision in the location and arrangement of hospitals, for the comfort of the sick, and the security of the well from such infectious and contagious diseases, as may develop during the voyage.

There is no reasonable doubt that the location of hospitals in the steerage, in rooms along covered gangways, where the only ventilation is through openings from the hospital into the gangway, or, as in some instances, by opening the doors of such hospital rooms, allowing the vitiated and infected atmosphere to be diffused among the masses of immigrants in the steerage, or inhaled by those who are in the passages, contributes to the transportation of the germs of disease into far distant interior cities, villages and hamlets.

The steamship *Rheinania*, from Hamburg, December 4, and Plymouth, England the 11th, arrived at the New York quarantine December 24, 1881, with five hundred and ninety-five steerage passengers taken on board at Plymouth from the disabled steamship *Lessing*, which left Hamburg November 13, and put into Plymouth the 29th of November. A child was sent to hospital from the *Lessing*, November 30, with so-called varicella. The 14th of December, Adelaide Therberg was discovered sick with small-pox (*variola discreta*), and put in hospital. Three days later (December 17), Wilhelmina Kreem, was found sick of the same disease, and the 19th of December, Elizabeth Luden was discovered suffering from varioloid.

It is evident that the case sent to hospital at Plymouth, the 30th of November, was small-pox instead of chicken-pox, and that the case which developed on the 14th of December, was the result of infection from that case. The cases discovered the 17th and 19th undoubtedly originated from exposure to the same source. The difference in the appearance of the eruption on arrival at quarantine did not warrant the conclusion that there was any considerable difference in the time of the development of the disease. The hospital room, in which the sick were nominally isolated, was located on the starboard side of the bow of the steerage. One closed port light, less than six inches in diameter, afforded whatever of air and light the room received from the outside. A horizontal aperture four inches in diameter, and two and a half in length above the door, opening from the steerage, answered the double

purpose of admitting to the sick air vitiated with the exhalations and filth of nearly six hundred human beings who had been forty days in the steerage, and conveying to the latter an atmosphere impregnated with the germs of a disease, than which few in the catalogue to which human kind is subject, is more certain in its effect, or more fatal in its results.

The inhumanity of such a condition; the outrage inflicted upon the people of a government that has extended so generous a welcome to the immigrants from all countries, in thus knowingly affording an opportunity to scatter the contagion of this disease far and wide, was emphatically expressed to the officers of the steamship. Results more beneficial than remonstrances, it is believed, will arise from the order which compelled the vaccination of all on board, and the transfer and detention of the steerage passengers to Ward's Island for observation, at the expense of the steamship company.

Until the adoption and promulgation of the "additional rules and regulations" by the National Board of Health, health officers at our maritime quarantines could take cognizance only of vessels which had certain infectious and contagious diseases on board, or on which there was good reason to believe the germs of infectious or contagious disease existed.

The laws establishing the methods of prevention of the introduction of small-pox into this country were not adapted to an age when the Atlantic is crossed in almost half the usual incubative period of that disease.

In compliance with the spirit of the "Rules and Regulations" referred to, and with a desire to apply them so as to make them obligatory upon steamship owners to secure a medical inspection of all immigrants when they embark, and to vaccinate all persons found unprotected, and at the same time embarrass commercial interests as little as possible, the following communication was published:

QUARANTINE, S. I., Dec. 24, 1881.

To Owners and Managers of Passenger Steamship Lines at the port of New York:—

The following rules and regulations have been adopted by the National Board of Health and approved by the President of the United States November 14, 1881:

1. That all persons coming from or through any foreign port or place in which small-pox exists, who after the 14th day of November, 1881, shall arrive at any port of entry within the United States, shall be subjected to examination as regards to their protection from that disease by the proper health authorities of the State within which such port lies; or in case such authorities shall fail or refuse to enforce this rule, then by some officer or other proper person to be designated by the President of the United States.

2. That in case any person so arriving shall refuse to submit to such examination or upon undergoing the same shall be found not sufficiently protected from small-pox, such person, and in case he or she be not *sui juris*, then also the person having him or her under charge, shall be detained in quarantine until he or she shall have been properly vacci-

nated, or shall have passed the period of incubation from date of last exposure.

Attention is also respectfully called to the following rule and regulation of the National Board of Health :

All merchant ships and vessels sailing from a foreign port where contagious or infectious disease exists, for any port of the United States, must obtain from the consul, vice-consul or other consular officer of the United States at the port of departure, or from the medical officer, where such officer has been detailed by the President of the United States for that purpose, a bill of health in duplicate which shall set forth the sanitary history of said vessel, and that it has in all respects complied with these rules and regulations.

Believing that protection of lives and health of the people demand the adoption of the foregoing rules and regulations, the following requirements will be made of the officers of steamships entering this port:

1. Bills of health will be required by the quarantine officials at this port in conformity with the above regulations.

2. All immigrants on arrival at quarantine will be subjected to examination as regards their protection from small-pox.

3. The examination of all immigrants by the medical officers of steamships within twenty-four hours after leaving port and the vaccination of those who gave evidence of insufficient protection through previous vaccination, will, if considered by the medical officer at quarantine to have been faithfully and intelligently performed, exempt immigrant passengers from such examination at quarantine as may be necessary to determine whether or not such passengers are protected from the effect of the contagion of small-pox, except where small-pox exists or has existed on board the vessel on the passage to this port.

4. A certificate or card in the hand of each passenger, or the parent or guardian of the passenger on which shall be written or printed "Protected" and signed by the medical officer of the steamship, will be understood to indicate that such passenger is sufficiently protected by previous vaccination or through the vaccination made on shipboard. All passengers not having such certificate will be considered and treated as exposed or unprotected.

5. The medical officers of passenger steamships will be required to verify under oath the number of persons considered protected by vaccination and small-pox.

6. All persons not protected will be vaccinated or subjected to a quarantine of observation.

The examination of such passengers as are vaccinated soon after leaving the port of departure, and shortly before entering this port to determine results, is earnestly enjoined upon medical officers.

Satisfactory evidence of adequate protection of immigrant passengers from previous vaccination, or thorough early vaccination by the medical officer of the ship, will not only contribute to the protection of the public health and security, but will promote the interests of passenger lines by saving time and expense at quarantine.

In June last the undersigned had the honor at a solicited interview with the managers of passenger steamship lines to call the attention of those interested in the transportation of passengers from ports in the British Isles and Continental Europe to the port of New York to the necessity for great vigilance at the port of departure in the protection of

immigrants from the contagion of small-pox — “for forcing inspection of immigrants to detect those unprotected by vaccination, the vaccination of all unprotected persons within twenty-four hours after leaving port, and the adoption of a regulation requiring good and sufficient hospital accommodation, to enable the medical officers of steamships to establish perfect isolation of developed cases of contagious disease, separately from suspected cases and from non-contagious diseases.” At the meeting referred to it was represented that, in view of the apprehension that existed, that infected immigrants would in numerous instances pass our maritime quarantines before the development of the disease, and in the interior of the State, or perhaps at widely separated and numerous points, in the West or Northwest, become foci for the dissemination of the disease, “the National Board of Health would be likely to ask the quarantines at our ports of entry to adopt restrictive measures not authorized by existing laws but which, authorized by the National Board and approved by the President of the United States, would have the force of law.” Your prompt and cheerful response to the appeal, as evidenced in the subjoined communication, was a source of great satisfaction to the health authorities :—

NEW YORK, *July 1, 1881.*

“Dr. WILLIAM M. SMITH, Health Officer of the Port of New York, Stapleton, S. I. :—

“DEAR SIR — At a meeting of the managers of steamship companies trading to this port, at which the following lines were represented, namely : — the Cunard line, the White Star line, the Rotterdam line, the Guion line, the North German Lloyds, the Italian line, the Inman line, the Hamburg line, the Bordeaux line, the State line, the Red Star line, the French line, the Monarch line and the Amsterdam line — after considering the interesting statement with which you had favored the meeting the representatives of the lines present, being desirous of adopting such measures as will insure protection against the introduction and propagation of contagious and infectious diseases, especially small-pox, it was

“*Resolved* :— That we will co-operate with the National and State health authorities in carrying out to the best of our ability such recommendations to effect this purpose as they may advise.

“The meeting was favorably impressed with the propriety and feasibility of the following measures, namely :—

“1. That intending passengers should be inspected and certified before departure.

“2. That all passengers should be vaccinated on board, within twenty-four hours after leaving port; and

“3. That all suspicious cases should be strictly isolated on the passage.

THOMAS S. SANDFORD, *Secretary.*”

The action of the managers which followed this communication was speedily evident in the increased vigilance of the officers of steamships and the marked diminution of small-pox among immigrants arriving at this port.

During the first seven months of the present year—which allows thirty days for the organization of the effort of steamship managers after

date of their communication — thirty-four vessels entered the port with small-pox. Since that time — nearly five months — but five cases have been detected. The number of vessels on which the disease occurred corresponds to the number of cases.

Protection of the life and health of the people of the United States, which is paramount to all other considerations, is now seriously jeopardized by the introduction through immigrants of this loathsome disease in its latent condition. If owners and managers of passenger lines will earnestly co-operate with the health authorities at our maritime quarantines, through the measures indicated, they will contribute greatly to arrest the introduction and propagation of a disease that now annually numbers more human victims than any and all forms of disease subject to quarantine.

It is proper to remind the owners and managers of those lines that suitable hospital accommodation for the isolation of the sick of contagious diseases is greatly neglected on many vessels. The continuance of this neglect will expose many immigrants to infection, and in case of contagious disease on board will subject the vessel to delay at quarantine and the line to expense, which might be avoided.

WILLIAM M. SMITH,
Health Officer port of New York.

It has long been a recognized fact, that infectious and contagious diseases at certain intervals, not regular, well defined, or always dependent on known causes, assume epidemic proportions in many localities in the same country, and in widely separated countries. In some forms of disease this is doubtless owing to certain thermometric, hygrometric and unsanitary conditions which favor the propagation of the germs of disease when introduced.

In small-pox, another factor than these, or the inherent law of the disease, must be taken into consideration.

During the period of rest, new material accumulates, through births, immigration, changes in the population, or renewed susceptibility to the disease. During these intervals in the development of the disease, protection by vaccination is scarcely thought of, much less attended to by the public; the authorities are silent and unconcerned while an advancing generation provides "fresh fields and pastures new" for a high revel of the disease.

Chapter 438, laws of 1860, which authorizes "the trustees of the several common school districts in the State, and the proper local boards of common school government in the several cities of the State, to exclude from the benefits of the common schools therein any child or person who has not been vaccinated, and until such time when said child or person shall become vaccinated," remained inoperative, practically a dead letter, for many years; and until the State Board of Health during the past year, through its present indefatigable secretary, brought it prominently to the attention of the people.

When the receptive soil which has accumulated through many changes, and which has been fertilized by many years of neglect, has been exhausted by the ravages of the disease, or by the vaccinator who is suddenly stimulated into activity by the development of accidentally scattered germs of the disease, and the fears of the people, the epidemic

ceases, and the disease disappears for years from communities where it has prevailed.

The Board of Health of New York city affirm that no case of small-pox originated in that city from January, 1878, until the fall of the succeeding year, embracing a period of nearly two years. There is no disease of an infectious or contagious character which is so cultivated by the ignorance and neglect of the people as small-pox; while there is none in which prophylactic treatment is more certain. In view of these *facts*, the indifference and prejudice of the people, of local Boards of Health, and even of legislative bodies, in the absence of immediate danger from the disease, is a matter of great surprise to all intelligent sanitarians.

The opponents of vaccination have failed to give a single reason for their opposition that should weigh against the fact which daily experience repeats, that vaccination properly effected secures perfect immunity from small-pox — not always for all time, though in many individuals it affords protection for a life-time. But by the early vaccination of all persons, and the revaccination after the expiration of eight or ten years, it is not too much to say that this disease may be banished from the list that afflict mankind.

The opposition, and sometimes decided refusal of immigrants arriving at quarantine to be vaccinated after known exposure to the infection of small-pox, have afforded satisfactory evidence that coercive measures of the most decided character will be necessary to secure that result.

In some instances where compulsory vaccination has been resorted to among immigrants arriving at New York, the vaccinated have resorted to washing, and even the employment of fellow passengers to suck the vaccination wounds to remove the vaccina. This prejudice against vaccination exists among immigrants of several nationalities — particularly among the Irish and English; created in considerable degree, it is believed, by the pernicious influence and teachings of anti-vaccination societies. The principal objection made by the anti-vaccinationists being the danger of transmitting to the vaccinated the constitutional or acquired diseases of the person from whom the virus is taken, is obviated by the use of carefully selected *bovine virus*. It has been estimated that not one case in 100,000 of vaccinations has been attended by unpleasant results. Abrasions or wounds of no greater severity than those necessary in vaccination, without the introduction of any infectious principle, would be likely to result as frequently in some unpleasant consequences from exposure to accidental causes.

The records of the Vaccine Department of the New York City Board of Health show that in the seven years previous to the 1st of January, 1882, 101,420 primary vaccinations and 343,708 revaccinations, were made without result prejudicial to life or health, which were justly chargeable to the vaccine influence.

The practical conclusions to be drawn from experience in the administration of the New York quarantine, so far as relates to prevention of the introduction of yellow fever and small-pox, may be briefly summarized.

In yellow fever, the immediate removal of sick to hospital, the detention of the passengers and crew until the usual incubative period has elapsed, reckoning from the last exposure at the infected port; the discharge of cargo, and cleaning and disinfection of the vessel insures pro-

tection. And if the history of the vessel during the voyage warrants the belief that it is infected, such of the passengers and crew as are not protected by climatic exposure or previous attacks of the disease, should be removed to quarantine of observation or detained on board the vessel until the time for development has passed.

In small-pox, the long period of incubation, and the conditions under which it now generally appears at our maritime quarantines, require the quarantinist to go beyond his own jurisdiction and arrest the contagion at the port of departure.

1. By securing an efficient sanitary supervision and police of lodging-houses and other places of resort for immigrants at the port of said embarkation.

2. The medical inspection of all immigrants by the physician of the steamship, within twenty-four hours after they go aboard, and the vaccination or revaccination of all persons not sufficiently protected by previous vaccination.

3. The certificating of such as are protected, by a card bearing the word "protected" or "vaccinated" and the signature of the medical officer.

4. The re-examination just previous to entering the port of arrival, of all that have been vaccinated on board ship, and the issue of such certificates to the successfully vaccinated.

If this system could be carried into successful operation, it would be the "ounce of prevention" that would render unnecessary the "pound of cure." It would crush out at the initial point the infection that cannot be eliminated by any reasonably restrictive measures at the port of destination, while the present tide of immigration is deluging the country.

It is well understood that no law of the State or of the National government bearing upon the action of steamship passenger lines, will be recognized as having any binding force in foreign ports, or on vessels under foreign flags in transit to ports in the United States. Hence the necessity of imposing such restrictive measures at our ports of entry, through State and National legislation, as will secure the active coöperation of owners and managers of passenger steamships. This, it is believed, will be effected by the adoption and vigorous execution of the following measures:

1. The examination and vaccination at quarantine of all immigrants not having a certificate of protection.

2. The detention of all unprotected persons who have been exposed to the contagion of small-pox, until the protective influence of vaccination is obtained, or until the incubative period of the disease has elapsed.

3. The removal to the quarantine of observation of all persons refusing to be vaccinated, and their detention fourteen days from last exposure.

4. The verification under oath by the medical officer of the vessel, that his duties in the examinations and vaccinations referred to have been faithfully discharged.

There is good reason to believe that the execution of these measures at the port of New York would result in the most earnest and vigorous measures on the part of owners and managers of passenger lines at the port of embarkation.

The following minutes illustrate the spirit in which an appeal to these parties was received. Their coöperation in the plan proposed, to the extent of their ability, is not doubtful.

Minutes of a Meeting of the Representatives of Trans-Atlantic Passenger Steamship Lines, convened at the request of Dr. William M. Smith, Health Officer of the port of New York, at No. 19 Broadway, N. Y., on Wednesday, June 29, 1881, at 10 o'clock, A. M.

Present — Dr. William M. Smith, and representatives of the following lines, namely:

The Cunard Line,	The Hamburg Line,	The French Line,
The Guion Line,	The North German Lloyd,	The Monarch Line,
The Inman Line,	The Red Star Line,	The Bordeaux Line,
The State Line,	The Rotterdam Line,	The Amsterdam Line,
The White Star Line, The Italian Line.		

Dr. Smith stated that he had sought this meeting in order to secure, if possible, the coöperation of the several lines in preventing the introduction of contagious and infectious diseases, especially small-pox, and thus avert action by the National Board of Health which was urged by State and local Boards throughout the country, in consequence of the general prevalence of small-pox among newly landed-immigrants.

That in May, 1880, foreseeing the probable extension of the disease, I proposed plans to guard against it, which did not then attract much attention, but the demand for restrictive measures is now very great, especially in the West.

At a convention held in Chicago on June 23d, 1881, action was taken, looking to the intervention of the National Board of Health, which caused me to think that the steamship lines should be advised to take such steps as would preclude the necessity for such intervention.

The National Board of Health has power to adopt rules which, when signed by the President, become law, and it is urged that a rule be adopted requiring all vessels to be quarantined for fourteen days from the time of the first exposure to small-pox; that is, if a case should manifest itself on the voyage when three days out, and the passage be made in eleven days, the ship must remain in quarantine for six days.

As the adoption of such a rule would seriously injure your interests, I have considered how it may be avoided.

The average passage by steamer is short compared with the period of incubation of the disease; passages being ordinarily made in from eight to eleven days, whereas the period of incubation is fourteen days; but, fortunately, vaccination operates more quickly yet, and may be depended upon to neutralize the disease if resorted to in time.

It has been my practice, when satisfied that the ship's surgeon has strictly isolated all cases on the passage, to pass the vessel without insisting upon the vaccination of the passengers, and I have done this to stimulate the vigilance of surgeons, but I have nevertheless discovered, in many cases, great negligence in this particular.

I think that if you will adopt the following measures, namely:

1. That intending passengers shall be inspected and their physical condition certificated, before embarking.
2. That all passengers shall be vaccinated on board, within twenty-four hours after leaving port; and

3. That all cases that may develop on the voyage shall be strictly isolated. And will assure me that you will enforce them to the best of your ability, I can satisfy the National Board of Health that it is not necessary to adopt the proposed rule requiring your vessels to be quarantined.

The thanks of the meeting were tendered to Dr. Smith for his courtesy and consideration.

Dr. Smith then withdrew.

The meeting then organized, Mr. William H. Guion in the chair.

After considering the statement made by Dr. Smith, the secretary was instructed to address him an official assurance of the disposition of the several lines to coöperate with the National and State Health authorities in carrying out to the best of their ability such measures as said authorities may recommend to prevent the introduction of contagious and infectious diseases, especially small-pox. And it was agreed that printed copies of the proceedings of this meeting be sent to the home offices of the several lines, with a recommendation that the measures proposed by Dr. Smith be carried out as far as practicable.

Adjourned.

The number of passenger steamships on which small-pox has been found on entering the port of New York, since the conference referred to (June 29, 1881), has been but one-fourth the number for the corresponding period immediately previous to that time.

Few immigrants will reach our quarantines with developed small-pox, and a less number will pass them with latent contagion, if the execution of these measures can be secured at, or near the port of departure. The examination of the immigrants *at quarantine*, the protection of the unprotected, and their detention until satisfactory results are secured, will not only protect the public, but will stimulate the exertions of those interested in immigrant transportation, to a degree scarcely less than the passage of laws of the same character by the government or local authorities at the port of departure.

Subsequent to the adoption of the "revised and additional rules," by the National Board of Health, and their approval by the president, a conference between the managers of passenger steamship lines, and the health officer of the port of New York, was convened, January 9, 1882, at the request of that officer, at the office of the "Trans-Atlantic Passenger Steamship Association," to consider how the "rules and regulations" referred to may be executed most effectually, and with the least embarrassment to the interests of the steamship companies, it was decided to recommend the home officers of the several lines to adopt the following protective measures, namely:

First—That agents throughout Europe be instructed to inform intending passengers that, unless they are vaccinated before leaving home, they will be subject to vaccination on the journey or to detention at quarantine for fourteen days after arrival.

Second—To endeavor to secure the vaccination by the authorities or by medical officers employed by the companies at the port of departure of such passengers as may have neglected previous protection.

Third—To require the vaccination on board within twenty-four hours after leaving port of such passengers as may have escaped or refused the foregoing opportunities.

Fourth—To provide hospital accommodation on board absolutely isolated from the quarters occupied by the passengers or crew.

Fifth—To instruct the medical officer of the ship to furnish each passenger sufficiently protected by previous vaccination a card on which shall be written or printed "Protected," and signed by such medical officer; as all passengers not having such a certificate will be considered and treated as exposed or unprotected.

The following are the companies represented :

Inman Steamship Company (Limited), by John G. Dale, agent; Oelrichs & Co., agents of North German Lloyd, Bremen; F. W. J. Hurst, manager National Steamship Company; R. J. Cortis, agent, White Star Line; Austin, Baldwin & Co., agents State Steamship Company; Red Star Line, Peter Wright & Sons, general agents, by George W. Colton manager, New York; for Louis de Bebian, agent, Aug. d'Orville; Patton, Vickers & Co., agents Monarch Line; Vernon H. Brown & Co., agents Cunard Line; Kunhardt & Co., agents Hamburg-American Packet Company; H. Cazaux, general agent Rotterdam Line; Liverpool and Great Western Steamship Company (limited), Williams & Guion, agents; Anchor Line, Henderson Brothers, agents.

In none of the contagious or infectious diseases subject to supervision at our ports are the relations of quarantine officials and municipal Boards of Health so mutually dependent, to prevent their introduction among interior communities, as in small-pox. Inspection at some local point by State or local authorities of the migration moving along the great thoroughfares, and observation and supervision for a few days, of that portion of it which disperses along the way, and a careful inspection under the direction of the National Board of Health, of all immigrants arriving at distributing points, such as Buffalo, Suspension Bridge, Pittsburgh and Port Huron, as a measure of inter-State quarantine is essential to safety. And when the people of the several States, either through the National government, or in their independent sovereign capacity, shall be so far advanced in their appreciation of the efforts of intelligent and philanthropic sanitarians, as to enable them to secure a compulsory law for vaccination of all unprotected persons, the most loathsome, most fatal, most frequent, and yet most preventable of the diseases which now afflict the human family, will be one of the most infrequent of those that now number their victims annually by thousands.

The work of the quarantinist who watches for "the pestilence that walketh in darkness," at the gateways from the sea to our great cities, is intimately related to that of local health officers. The disease-producing germs, latent or otherwise, that escape the former, find no lodgement in the presence of the latter. The filth and waste that follow in the footsteps of men in the busy marts of commerce, and the crowded tenements of the poor, in the absence of intelligent sanitary work and in the presence of conditions that impair the vigor, and lower the vitality of human beings, become a fertile field for the propagation and cultivation of infectious and contagious germs, until, from sporadic cases, the proportions of an extensive and fatal epidemic is reached.

The humbler classes may suffer first, and most; but the forces of disease when recruited in the slums of streets, and crowd poisoned air of filthy lodging and tenement houses, extend to the homes of culture and refinement, victimizing alike in these ranks the valued and valueless, the worthy and the unworthy.

Respectfully submitted,

WM. M. SMITH, M. D.,
Chairman of Standing Committee on Quarantine.

TYPHUS FEVER.

As the true typhus, or ship fever, had for almost twenty years so nearly disappeared from the city of New York as to warrant the hope that it might not again become prevalent, the reappearance of it in the cities of New York and Philadelphia during a time of unusual prosperity and in the presence of a surplus of food, is chronicled in the following abstract of records of the present experience. This old enemy of neglected and impoverished crowds in great cities and unventilated lodgings has lost none of its traditional contagiousness.

ELISHA HARRIS, *Secretary.*

AN ACCOUNT OF TYPHUS FEVER AS IT APPEARED IN THE CITY OF NEW YORK, DURING THE YEAR 1881, BY E. H. JANES, M. D., ASSISTANT SANITARY SUPERINTENDENT, ETC.

To Secretary of the State Board of Health:

On or about the first day of September, 1880, a young woman, twenty-three years of age, living in a tenement house on Avenue C, and working in a collar factory on the east side of the city, was taken sick with what was believed by her physician to be typhoid fever, from which she began to convalesce the fourth week, and finally recovered.

On the 24th of the same month, the mother, aged fifty-eight years; a sister, aged twenty-seven; another sister, aged twenty, and a brother, aged twenty-eight, were all reported to the Board of Health as sick with "typhoid" fever and were therefore removed to Riverside hospital. The apparent contagiousness of these cases, with certain symptoms appearing which are not ordinarily seen in *typhoid* fever, arrested the attention of the resident physician, and upon consultation with the Health Commissioners, and a careful examination of the cases, it was found that the symptoms were those of typhus fever. This diagnosis was further confirmed by the subsequent illness of the nurse who took care of the Brady family, and who in due time was attacked with true typhus. Her's was a typical case, and for some time her recovery seemed doubtful. About the same time or a little later, a case of "typhoid" fever was reported in a tenement house in West 27th street. The premises, as is the usual practice in such cases, were visited by a sanitary inspector, who found the hygienic condition to be very bad. No examination was made of the patient and the diagnosis was accepted, as well as that of one or two other cases which occurred in the same house, the impression being that the sickness was due to local causes. Some days later it was learned that the first of these patients had worked beside one of the Brady girls in the collar factory.

How many cases of the fever may have preceded those of the Brady family, or how many may have immediately followed them unrecognized, is not known, for the next case on record is a death at St. Francis hospital, which occurred on the 21st of February, 1881.

On the 14th of March there were admitted to Riverside hospital, from Charity hospital, four cases, two of which had come from the "Shiloh Shelter," a lodging house, No. 57 Prince street. On the 15th two cases were admitted from Bellevue, both having been lodgers at "Shiloh." On the 16th six cases were admitted from Charity, seven from Bellevue, and three from the German hospital. Of these, three had come from "Shiloh." On the 17th ten cases were admitted from various sources, including the three hospitals above mentioned, three of whom had lodged for some time in "Shiloh," and two were from the house in West 27th street where the earlier cases, supposed to have been typhoid, but now, from their relation to the Brady family, believed to have been typhus, had occurred.

On the eighteenth six cases were received, four of whom were from "Shiloh." During the week ending March nineteenth there were reported to the Board of Health and received at Riverside hospital forty cases of typhus fever from hospitals and from their homes, of which number fourteen were from "Shiloh." After this there was a partial abatement for two weeks as follows: week ending March twenty-sixth, seven cases; week ending April second, ten cases. The number now increased to forty-one during the week ending April ninth; to sixty during the week ending April sixteenth, which was the largest number reported during any one week. From this time the number gradually diminished, though varying from week to week until week ending August twenty-second, during which one case was found at Charity hospital and removed to Riverside. On the twenty-fourth of September one case was reported from the Ninety-ninth street hospital by the coroner's autopsy. No other cases occurred until November first, when six boys, ages varying from nine to thirteen, were sent from St. Joseph's Home, number fifty-three Warren street, to Randall's Island, supposed to be suffering with typhoid fever. On the twenty-second of November four other boys were sent from the Home to Randall's Island as typhoid, all of which were subsequently diagnosed as typhus. During the next three days sixteen boys, aged from six to twelve, were sent from the Home to the Riverside, and on the first of December James Daly, aged 42, a teacher in St. Joseph's Home, was reported sick with typhus at St. Vincent's hospital and removed to Riverside where he died, the autopsy confirming the diagnosis as well as settling any doubts that may have existed in regard to the boys, in all of whom the disease was of a mild type. December sixth, four boys were removed from the home, after which no other cases occurred in the institution.

During the year five hundred and six cases of typhus were treated at Riverside hospital, received from different parts of the city, many of them from crowded lodging houses, and of that class of men known as tramps having no homes and lodging wherever they can find shelter. Among the lodging houses, "Shiloh" contributed by far the largest number, being twenty-nine in all. Fourteen were from the lodging house number 61 Thompson street; eight from 112 Green street; five from number 80 Wooster street, five from number 10 James street, four

from number 152 Chatham street, and three from the tenement house in West Twenty-seventh street, indicating that the contagion had persistently adhered to the house through the winter months, notwithstanding fumigation and disinfection.

The above are only a few of the lodging and tenement houses which contributed from one to three or four or even more cases each during the season, many of the patients having been in the habit of going from one lodging house to another forming a net work of contagion which made the grouping of cases extremely difficult.

The diagnosis in all the cases was based on the prominent symptoms of typhus, as the cerebral symptoms, the dullness of the intellect, the peculiar expression of the countenance, the characteristic eruption with elevation of temperature. These symptoms with the evidence of contagion were present in all of the cases.

As is usual in typhus, the lesions were neither uniform nor strongly marked, save, perhaps, enlargement and softening of the spleen which was generally present, with a dark, and fluid appearance of the blood. The following lesions were also found in most of the cases: The pia mater at the base of the brain showed opaque, white lines, which were also noticed on the pia mater of the ventricles. The pia mater of the cervical region had a slightly dull look. Lungs œdematous and somewhat congested in lower lobes. Kidneys and mucous membrane of the stomachs and small intestines more or less congested. Liver fatty.

This unexpected advent of typhus found the city health department not fully prepared to meet the emergency, as nearly all of the hospital accommodations were occupied in the care of small-pox, and such other contagious diseases as were refused admission to other hospitals. The only means at command for the reception and care of typhus patients were hospital tents, which were obtained and placed in position on the grounds of Riverside hospital, Blackwell's Island, with as little delay as possible. Thus in a short time there was ample room, and although the weather was severe during the month of March and the early part of April, the tents were made comfortable and the patients generally did well, the proportion of recoveries being very fair, as will presently be seen.

With a view to the early suppression of this outbreak, a special corps of inspectors was organized, whose duty it was to make frequent visits to all lodging houses in the city for the purpose of enforcing a better system of cleanliness and ventilation, and of detecting any new cases of fever. Many of these visits were made at night, at which time every lodger was carefully examined; and by this course many cases in the incipient stage of the disease were found and at once removed to the hospital for treatment. The question of closing some of the more crowded lodging houses was very carefully considered by the health department, but as there was full reason to believe that such a course would have the effect to scatter the lodgers throughout the city and establish new centers of disease, it was wisely determined not to interfere any farther than to induce the proprietors to refuse all new applications, thus each house keeping its regular lodgers and admitting no others, the system of nightly inspections was facilitated, and the disease more readily brought under control.

In addition to these frequent inspections at night, daily inspections

were also continued, and two or three times a week the houses where fever had occurred were fumigated with sulphur. Tenement houses in which the disease was found were all subjected to a like daily supervision. On his arrival at the hospital the patient's clothing was removed from him and destroyed, it in many instances being extremely filthy and "alive with vermin." Hospital clothing was furnished during the term of sickness, and when the time came for the patient's discharge a new suit throughout was furnished, at the expense of the health department whenever the patient's circumstances were such that he had no friends, or was unable to supply himself. *It was an invariable rule not to allow typhus clothing to find its way back to the city.* This careful watching of every place where the fever appeared, the early discovery and separation of the sick from the well, the frequent disinfection and fumigation of apartments, the enforcing of more thorough cleansing, and ventilation, with the immediate destruction of infected clothing, are believed to have been the successful means of arresting the progress of a disease which at one time threatened to become a pestilence to our city. Doubtless the determination of the health department not to break up crowded lodging houses where the fever existed, notwithstanding frequent petitions from citizens and property owners in the vicinity of such places, did much to prevent the disease from spreading more extensively throughout the city. Acting on this view of the subject, and fully believing in the importance of early discovering every case, and that this could be done only by daily and nightly visits, the department took no aggressive steps towards the evacuation of any lodging house until some weeks after the last case had been removed.

The total rate of morality during the season was twenty-four and fifty-one one-hundredths per cent, a ratio quite satisfactory when it is remembered that a large number of the patients were broken down by alcoholism, exposure, or semi-starvation.

The following table has been carefully prepared by Doctor Chapin, and will be examined with interest.

Riverside Hospital — Typhus Fever, 1881.

AGES.	ADMITTED.				DIED.			Ratio of deaths to admissions for each decade.
	No.	Percent.	Males.	Females.	No.	Per cent of total deaths.	Males.	Females.
Five years and under.....	3	0.60	1	2	....	.....	.....	.....
Five to ten.....	19	8.75	16	3	....	.....	.....	.....
Ten to twenty.....	50	9.98	43	7	4	3.92	.....	.....
Twenty to thirty.....	147	29.06	124	23	23	17.74	4	.....
Thirty to forty.....	147	29.06	125	22	41	33.07	17	5
Forty to fifty.....	70	15.41	63	11	24	19.36	33	8
Fifty to sixty.....	38	7.51	34	4	19	15.32	23	4
Sixty to seventy.....	20	3.96	19	1	11	8.87	17	2
Seventy to eighty.....	8	0.60	8	.....	3	2.42	10	1
Total.....	506	100.00	433	74	124	100.00	104	20
								24.51.

By examining the above table it will be seen that of the twenty-two admissions of patients under ten years of age, there were no deaths; of those admitted from ten to twenty, eight per cent died, while for each following decade the death rate increased.

Among the nurses and attendants at the hospital, two nurses, six orderlies, and four female helpers took the fever, of which one orderly and one helper died. Only one orderly and two helpers escaped, and of the latter one was said to have had the disease during a previous epidemic. The others who were exposed were the matron who was daily among the sick, often doing the duties of nurse, and the nurse who later in the year had charge of the children from St. Joseph's Home. Both of these escaped the fever. Whenever an attendant was taken sick, there was generally a recovered patient ready to fill the vacancy, and thus new exposures were avoided. The physicians in attendance, although feeling for a few days indisposed, with an elevation of temperature, both escaped the fever. The faithfulness of physicians and nurses in their devotion to the sick was unremitting both night and day, and cannot be too highly commended.

In regard to the original causes of this outbreak, there is a lack of positive information, especially if we are to look upon typhus as an exotic depending for its development on importation. It was thought by some to have been brought from Camden, N. J., where there had been a number of cases, but investigation failed to establish the entire truth of this statement. The fact that one or two tramps passed through Camden on their way to the city of New York, where they arrived about the time the fever broke out, does not prove that they brought the fever with them.

If we look upon typhus as a filth disease, developed *de novo* amidst filth and poverty, we may look to the condition of some of the lodging houses for a possible solution of the question. It will be remembered that the winter of 1880-1881 was one of unusual severity. Tramps from all parts of the country flocked to the city for food and shelter, which they can always obtain, the former by begging from door to door, the latter at the five and ten cent lodging houses. In this way the cheap lodgings and police stations were crowded as they had rarely or never been crowded before, while the cold nights found all of the windows securely closed, thus shutting out every breeze of fresh air from the apartments, leaving the sleepers to rebreathe for hours the same atmosphere, which constantly became more and more contaminated from busy lungs and filthy bodies. As there were no beds in these cheap lodging houses, except raised platforms of plain boards, the lodgers never undressed, but wore the same clothing, night and day, week after week, until it became saturated with animal exhalations. Some of the patients were so dirty that it was not until after a good washing that a diagnosis could be established by the eruption. Living for an entire winter under such influences, if not sufficient to develop typhus, is certainly favorable to its propagation.

EDWARD H. JANES, M. D.

REPORT OF THE COMMITTEE ON DRAINAGE, SEWERAGE AND TOPOGRAPHY.

This committee reports progress in the duties that have been assigned to it by submitting the more important papers that have been referred by the Board during the year, accompanying the same with a brief account of the results of investigation relating to the subject to which they refer.

The committee has to call attention to the fact, which appears in nearly all the petitions and papers that have been referred for investigation, that the State has not yet enacted any general drainage law adapted to the common necessities of the communities and districts which suffer most from neglect and obstruction of drainage; and that there is found to be no adequate provision of law to prevent the pollution of streams and other sources of drinking water. Few, if any, of the numerous petitions and complaints which have been referred by the Board to this committee, and less than one-half of the cases that have been presented by appeal of the inhabitants, to the Governor, and by his direction referred to the Board, are found to be susceptible of correct sanitary and engineering treatment, under what is known as the General Drainage Act of 1869, and the amendments of that act.

The natural topography of the State of New York has determined its normal drainage areas, and these are not difficult to understand with reference to the essential questions which relate to sanitary drainage. But the committee has to notice in numerous instances that the immediate occasion for a complaint and appeal to the State Board, with regard to the drainage or improper outflow of sewage into sluggish streams or ponds, lakes, etc., requires a more comprehensive treatment of the primary questions of drainage and sewerage than a single village or neighborhood will separately undertake to give in such matters. The jurisdiction of village, or even of town authorities, must not unfrequently be largely transcended in the study and preparation of really *adequate* plans for the drainage or sewerage that is required for the protection of the public health. For this reason the committee unhesitatingly calls the attention of the Board to the importance of vesting in some suitable source of correct judgment a wise and useful discretionary authority for approval, at least in regard to plans for sanitary and economic drainage as demanded for the protection of life and health under the various circumstances in which the immediate local authority cannot, or will not, devise and put into action all the necessary plans for securing the sanitary interests of a community. Perhaps no better illustration of this

can be presented from the list of cases that have been referred to this committee than that which was found to be of general importance in the village of Croton Falls, a hamlet which had not sufficient population to obtain incorporation. The four townships contribute a corner of their contiguous territory, respectively, within the limits of the village area which requires systematic drainage to render life and health reasonably secure. Not one of these four towns could consistently undertake, through its Health Board or otherwise, to devise plans and provide for the execution of the work by which the drainage and the outflow of that little village shall be sanitarily and economically satisfactory and sufficient. It was found by Engineer Croes, who accompanied a member of this committee on the inspection, that each of the four townships shared to some extent in the responsibility for the sources of nuisance and danger, which should be at once prevented by the adoption of a simple system of ground drainage and safe outflow from dwellings, to fields or streams, at a suitable distance from their doors.

The Croton river bisects the village and offers facilities for the defilement of its waters. There is no settlement of the question of sanitary duty as regards the village and the Croton river, without first determining upon, and adopting a suitable plan for the village drainage, and its outflow of excrement and waste. A like necessity for the adoption of a suitable general system or plan of drainage, etc., for an area that comprises parts of contiguous townships, will be noticed in the papers, herewith submitted, relating to drainage along the line of the abandoned canals in Schuyler, Chemung and Livingston counties.

To meet numerous calls of duty this committee has from time to time been permitted by the Board to engage temporarily the services of expert civil engineers who have acceptably met the exigencies which have arisen in the Board's service in this respect. We would refer particularly to a few papers that are submitted to illustrate the extent of the work which the Board has undertaken. Among the most important questions now before this committee and the Board itself are; —

1. What should be recommended as the best plan for a separate and most economical system of sewerage for villages and small cities; and by what methods shall the outflow of storm-water and the soil-drainage of such places be secured?

2. In what manner shall the ground-drainage of building-sites be thoroughly secured for separate dwellings and ordinary villages?

3. What provisions are required in a general drainage law that shall be applicable and most useful throughout the State, and which shall treat natural drainage areas in the most effectual and economical way, yet mainly at the expense of towns and estate owners, without involving such works in the discredit and vexation of county bonds?

4. What other, if any, of preliminary work relating to sanitary drainage, should the State bear; and what judgment and responsibility may justly be regarded as proper to require of the State Board of Health with respect to determining the necessity of, and plans for, each project of general drainage?

These are practical questions, sure to be thrust upon the attention of the State Board and of the local Boards of Health from time to time. As every drainage project, and every scheme for storing or reserving extensive bodies of water will ever involve important sanitary consideration, this committee respectfully submits the question, "Ought not the

State Board of Health to secure the preparation of a suitable project of law to meet the question here mentioned; and ought not the State to direct that its engineer and surveyor and its Board of Health shall not only examine and approve, but counsel and aid in regard to proposed drainage works under a general drainage law?"

This committee finds the most important questions which were referred to it by the Board have a wider scope, and that the study of them, has a more general importance than has usually been implied in the reasons given by the local authorities and citizens who have applied to the Board for advice on these subjects. For example, the nuisances caused by stagnant pools and malarial grounds that are accused of bringing half the population under medical treatment for miasmatic sickness, are precisely like those which many a little hamlet, many an owner of mills and shops, and many a farmer even lets exist, to the great harm of families and working people who are exposed to these results of sheer neglect and ignorance. In other words, the questions and petitions which a local Board of Health, or a larger number of citizens in a village or city, send up for the consideration of the State Board or the Governor of the State, are in a smaller, but not less important, way the very questions that have to be asked, and the very petitions or demands that ought to be made, in every neighborhood where local causes of diseases are produced and neglected. This committee believes it to be the duty of every local Board of Health to make such faithful and timely sanitary inspections and maintain such a habit of correct general and special observations, of the local and domiciliary causes of fatal sickness, that there shall be throughout the State a wise oversight and repression of all the causes of the malarial and filth diseases. If adequate sewerage and safe house plumbing must be provided in cities, then surely in the village and rural towns there should be no reeking ditches and pools of excremental filth, and no ventilation of cesspools into the dwellings which they endanger, nor should cottages and rural homes be permitted to have about them any preventable sources of foul air and disease poisons. Even the watering places and summer retreats, to which a vast proportion of the city and village population resort, must be protected as never yet they have been by law and correct sanitary practice for the prevention of diseases from their filthy outflowing and their miasmatic environment. The committee in concluding this brief report submits a large variety of special papers and statements which amply illustrate the importance of the several points here presented.

Respectfully submitted,

For the Committee,

E. HARRIS, *Secretary*.

ABANDONED CANAL NUISANCE AND MIASMATIC DISEASE IN CHEMUNG
AND SCHUYLER COUNTIES BETWEEN HORSEHEADS AND HAVANA.

The Chemung canal, extending from Watkins to Elmira, was abandoned in 1878. Its 45 locks and levels, between Havana and Horseheads, soon became the seat of obstructed pools, and, as shown in this Board's first report, the physicians in that region unanimously accused this nuisance as the cause of unusual sickness along the abandoned canal.

The first drainage work extended to lock 45, 4 1-2 miles north of the village of Horseheads. The long level extending from lock 45 to Horseheads village remained a nuisance, which cannot be completely abated as long as that village maintains the dams that the legislature of 1880 authorized (chapter 379, of 1880) for giving that village an artificial pond. The dam across the canal in the village, as authorized by that law, completely obstructs the outflow from the long level, though a natural creek, which should have its drainage southward into the Chemung river.

An abstract of petitions and medical testimony relating to the evils we are about to describe in this account of sanitary work along the line of the late abandoned canal, extending southward from the head of Seneca lake, was presented in the report of this Board a year ago. It was shown conclusively that a large proportion of the families in the immediate vicinity of the abandoned canal, had suffered grievously from miasmatic fevers and other disorders, and as these maladies reappeared, and were much complained of during the month of May of the present year, the President and Secretary as members of this committee made a tour of inspection on the 30th of May, and reported to the Governor the results with the following statements.

To His Excellency, A. B. CORNELL:

The undersigned, a committee of the State Board of Health, appointed to report on the nuisances alleged to have been caused by the abandonment of the Chemung canal, would respectfully report:

That they have made personal inspection of the places complained of, and taken the testimony of physicians who have care of the people in the neighborhood. The amount of sickness is appalling, no family escaping the invasion of malarial diseases, for a distance of two miles along the borders of the old canal, even children at breast becoming purple and shaking in the cold stage of intermittent. We find the prism of the abandoned canal has become a marsh. But we believe the whole danger can be removed by simply ditching, with a little filling at special points. We advise if such work is undertaken, that the ditches be so protected at the sides as to become durable.

(Signed)

E. M. MOORE, *President.*

ELISHA HARRIS, *Secretary.*

Thereupon, the Governor transmitted this brief communication to the legislature with the following request :

The attention of the legislature is respectfully, but earnestly, called to the importance of providing for the prompt abatement of a nuisance emanating from the present condition of the abandoned Chemung

canal, and dangerous to the health and lives of people living in the immediate vicinity.

The report of the State Board of Health, to whom the complaint of citizens was referred for investigation, is herewith transmitted, from which it will be seen that great suffering is now felt in consequence of the neglect of the State to provide suitable protection against the evils complained of.

It is hereby recommended, therefore, that the Superintendent of Public Works, be authorized to take the necessary steps to remedy the existing difficulty, and suitable appropriation be made for that purpose.

(Signed) ALONZO B. CORNELL.

Dated June 1, 1881.

Acting upon this information and request, a sufficient appropriation was made.

Before the Governor had signed that act which had passed both branches of the legislature, the appeals for advice from that portion of the country bordering upon the abandoned canal, between Mount Morris and Dansville in Livingston county, received attention from members of this committee, under direction of the Board, and upon reporting back to the Governor the results of inspection in that region, the enactment here mentioned was returned to the legislature, and by it amended, and passed, becoming chapter 593.

The superintendent of public works proceeded early in July to execute as much work as practicable before the 10th of August, a period at which it was deemed expedient to terminate such drainage work for the time being. During that brief period of less than six weeks, thirty-nine levels of the Chemung branch of abandoned canals were drained. A description of the drainage work is presented in the report made by Hon. Dr. G. M. Beard, here submitted on a subsequent page.

Abandoned canal nuisance. Late Genesee Valley canal, between Dansville and Scottsville.

An appeal by the local Board of Health of Groveland, Livingston county, here annexed, was supported by such medical testimony that it became necessary for the State Board to report to the Governor, the results of an examination which he directed to be made. The following is the petition:

To the State Board of Health:

The undersigned, the Board of Health of the town of Groveland, county of Livingston, State of New York, would respectfully represent:

That the condition of the Genesee Valley canal since its abandonment by the State, and especially at the present time, is causing a great amount of sickness in said town of Groveland, in the vicinity of the canals. The recent rains have made pools of standing water in the prism of the canals, which there is no possible means of draining off by the adjoining owners, or by the town Board. This stagnant water has become very offensive, and the probability is that if some steps are not taken at once to remove the nuisance, malarial fever, and other kindred diseases which have already become very prevalent in the vicinity of the canal, will there become a pestilence.

We therefore respectfully ask that some steps may be at once taken

by your honorable Board to avert such a calamity, by providing some means of draining such stagnant water from the canal.

Dated GROVELAND, N. Y.,

May 27, 1881.

(Signed) JOHN W. SICKLAY,

" R. J. KELLEY,

" WM. W. WISE,

" EDWARD W. MANN,

" RICHARD JOHNSON.

The report on behalf of the Board's committee and by authority of the Board to the Governor, is as follows:—

To Hon. A. B. CORNELL, *Governor*:

SIR :—The undersigned members of the State Board of Health, being the committee appointed by the Board to examine and report upon the sanitary requirements of certain portions of the abandoned canals, respectfully report that the complaint and petition of the Board of Health is found by us to be fully sustained by the facts in the case, as learned by the personal inspection of one of us. We find that from the village of Mount Morris southward for a distance of seven miles and upwards, within the towns of Groveland and Mount Morris, the bed or prism of the canal has become an artificial swamp, due to want of drainage and to various obstructions, such as the deposit of earth by storm-floods, the breaking down of banks, the construction of crossings, etc., and in a few places the diverting of natural water-courses in connection with canal construction and the defense thereof in former years. The faulty construction of crossings has not, until recently, been prevented, but the evils thus caused can be speedily remedied by the town authorities. Yet if so remedied, as they soon may be by local authorities, the greater portion of the bed of the canal, for miles in extent, would still be in the condition of a miasmatic swamp which will be dangerous to health and life until it shall have been thoroughly ditched and drained, and until certain streams are prevented from overflowing into and choking the bed of said canal.

We find the existing swampy bed of said canal is a nuisance dangerous to life and detrimental to health to a large number of inhabitants in its vicinity. We also find that the Board of Health of the town of Groveland has correctly represented that neither the owners of the adjacent property, nor the Town Boards of Health can suitably drain and protect said abandoned canal, so that it shall cease to be a nuisance; therefore, we respectfully recommend that whatever and in whomsoever vested the ownership and holding of the said bed and premises of the canal in the towns of Groveland, West Sparta, Nunda and Mount Morris, may be, the responsibility for abating and preventing the nuisances herein described shall be fixed and the official orders be served and enforced for abating and preventing said nuisance.

We further report that there are certain natural water-courses, and probably one or two artificial changes in old waterways that will need to be controlled and protected from contributing to the nuisances in and about said canal, and that as all said works for such control and prevention of evil from said water-courses need to be executed by authority of the State and at its expense, it seems expedient that a sufficient sum be provided by the State for said purpose.

So urgent is the work required in Groveland section of the Genesee Valley canal that we respectfully recommend that the persons and parties who own or hold the said canal should be immediately notified of the action required by the State for the abatement and prevention of the nuisance as herein described.

E. M. MOORE, *President.*
ELISHA HARRIS, *Secretary.*

The Superintendent of Public Works proceeded to execute such drainage works as were found to be permitted under the conditions that existed at the end of July when the workmen commenced. Dr. Ames, of Mount Morris, consented to represent the State Board in its sanitary advice, and from day to day, concerning the sections which should be drained with safety during the month of August with reference to the greatest relief from the sources of malaria suffered in regions between Dansville and Mount Morris.

The following preliminary report by Emil Kuichling, C. E., made under direction of the State Board, and the report of Dr. Ames which follows, explain all that needs to be presented in this place.

PRELIMINARY STATEMENT WITH REFERENCE TO THE DRAINAGE OF THE
DANSVILLE BRANCH OF THE ABANDONED GENESSEE
VALLEY CANAL IN LIVINGSTON COUNTY.

By Emil Kuichling, C. E., Rochester.

ROCHESTER, N. Y., July 22, 1881.

DR. E. M. MOORE, *President of the State Board of Health,*

DEAR SIR: On the 14th inst., the undersigned received from your Board instructions to proceed, on Friday morning, July 16th, to the village of Mt. Morris, Livingston county, N. Y., and to make, in company with Dr. L. J. Ames and Mr. Wm. Napier, Assistant Superintendent of Public Works, an examination of the sanitary condition of the abandoned Genesee Valley canal in Livingston county, and determine upon methods for removing from said canal such stagnant water as might be found.

In accordance with the instructions received, the undersigned would herewith submit the following preliminary report:

Upon my arrival at Mt. Morris at 10:30 A. M., on Friday, July 16th, I found Dr. Ames awaiting me at Mr. Miller's store, and learned from him that Mr. Napier had reported to him earlier and then departed for Genesee in order to attend a lawsuit in which his presence as a witness was imperatively necessary. Inquiry by telegraph elicited a reply that Mr. Napier would be at liberty to return to Mt. Morris at about 3 o'clock that afternoon, and therefore it was decided to await his arrival before going over the line of the canal. In the meantime Dr. Ames and the undersigned called upon Mr. T. Gamble, Supervisor of Mt. Morris, Dr. Joslyn, local Health Officer, and Mr. C. J. Perry, clerk of the local Board of Health, for the purpose of obtaining a statement of the general sanitary condition of said township and of any nuisances caused

by the construction and abandonment of the canal. It may here be mentioned that no complaints concerning the village and its immediate vicinity were offered, owing to the effective measures that had already been taken by the local authorities of said village to remove any stagnant water in the bed of the abandoned canal.

Immediately after his arrival from Geneseo, Mr. Napier, Dr. Ames, Dr. Joslyn and the undersigned proceeded over the line of the canal from Mt. Morris to Dansville. The general course of this section is south-easterly, and, for the greater portion of the distance, winds horizontally along the hill-sides at a comparatively small elevation above the general level of the alluvial lands of the valley, the towing path being almost entirely an embankment.

A large amount of surface drainage from the hills is intercepted directly by the canal; and hence many of the natural water courses which originally traversed the lands on the northern and eastern side of the canal, became dry and have gradually been obliterated by the action of the elements, and also by processes of agriculture. It therefore becomes evident that if the canal were to be drained by means of cuts through the towing path embankment, great care should be taken to locate such cuttings at points where suitable water courses or drainage ditches are conveniently at hand. There are, however, upon this section of the canal, a number of culverts, waste-weirs, spillways and aqueducts, all of which can be utilized in the removal of any water that may find its way into the abandoned channel, and accordingly cuttings through the tow-path bank will be required only in a few instances.

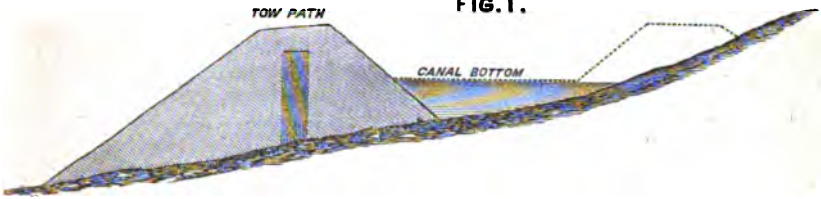
The general plan herewith recommended by the undersigned for disposing effectually, and at the same time very economically of the water which now collects and becomes stagnant in this portion of the canal, may briefly be stated as follows:

To thoroughly break up, by plowing, the thin and relatively impervious layer of accumulated silt, or the lining of clay or argillaceous earth which was originally deposited upon the canal bottom wherever necessary for rendering it water-tight; and then, by means of horse-scrapers, to remove the loosened impervious material to the banks or sides or to any convenient depressions or hollows. A shallow trench about three (3) feet wide can thus be rapidly formed in the bed of the canal and access obtained to the porous strata below, into which large quantities of water will readily pass by simple absorption. But to render the work of drainage still more effectual, it is recommended that the above described trenches be cut with a slight, but uniform grade, from a point or summit about midway between two consecutive places of discharge, for which natural water-courses of suitable magnitude should be chosen. These latter may always be reached by opening a culvert, or by lowering the abutments and breast-walls of aqueducts and spillways; or, when unavoidable, by direct cuts through the towing path embankment. It will thus be seen that by the plan indicated in the foregoing, large volumes of storm water will be conveyed to natural and open water-courses, while small quantities of rain or melted snow will be disposed of quickly by being absorbed into the permeable earth exposed by the trenches.

In a few instances, pools or small ponds of more or less depth are found in the canal bottom, especially upon the estate of the late

Dr. Fitzhugh. These pools are formed by the construction of the tow-path embankment across a gully or small ravine whose bed was origi-

FIG. 1.

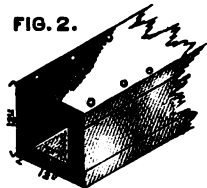


nally below the bottom of the canal, as indicated in Fig. 1, but which was not filled up during the construction of the canal in order to save expense. The dotted lines in the diagram indicate the work of embankment that would have been required in order to make the channel of uniform section throughout. Several such pools are in close proximity, and if the dividing ridges separating them are not too high, the group may be connected by a communicating trench, and then emptied through a single cut made in the tow-path bank. Where, however, the pools are too far apart to be economically connected, each must be provided with a drainage sluice, and the water conducted into some convenient water-course or land ditch.

Gullies or ravines of this description convey frequently large quantities of storm water which can not be permitted to flow unrestricted over cultivated fields that have been formed over the former water courses in the low lands beyond the canal; and even where land drainage ditches are found in natural depressions, such ditches are not of suitable size to receive, without overflowing, the discharge of these gullies. In these cases, and also in all places where the towing path embankment is designed to be converted into a public highway, and cuts through the banks are necessary, it is recommended that wooden outlet sluices be inserted into and through said bank at sufficient depth to remove all of the water; and that such sluices be of small cross-sectional area, both to gain the scouring action of the water for maintaining them open, and also that a relatively long period of time shall elapse before the pond becomes empty. Should more water arrive at such a sluice than it is capable of discharging the pond or pool will fill up, and the surplus water then finds a ready escape through the trenches in the canal bottom towards some large water course; and after the storm has ceased, the small sluice will continue to perform its duty until the pool is dry.

The undersigned is of the opinion that these sluices will be most economical, and also very durable when made of sound white oak plank, 2 in. or 2 1-2 in. thick, well spiked together and giving a clear

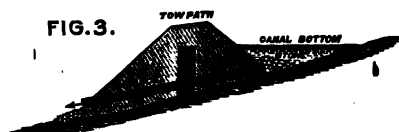
FIG. 2.



opening of about 7 in. or 8 in. square, as shown in Fig. 2. Such sluices

are quickly constructed and put in place; and when properly spiked together, they are tight and adapted to conveying water under pressure, besides being flexible enough to yield without injury to slight displacement by frost or settlement.

To check and regulate the discharge into a small water-course or land-ditch from one of the sluices, and also to prevent the earthen bank at the inlet from being washed away, a quantity of loose stone, or brush and stone, should be deposited over and around said inlet at the bottom



of the canal or gully, as indicated in Fig. 3. It is better to use the loose stone freely, as the water will then become partially filtered before reaching the sluice, and thus render the latter less likely to become choked up by silt or rubbish.

Having thus stated the general methods recommended to be pursued in the drainage of the Dansville branch of the abandoned Genesee Valley canal, the undersigned will now submit a list of the several items of work to be performed by Mr. Napier, beginning at the Kishaqua aqueduct, at the juncture of the said Dansville branch with the main line of the canal, and extending for the present to the first lock south of the Canaseraga aqueduct:

1. The south abutment of Kishaqua aqueduct to be lowered.
2. Open culvert designated as structure No. 45.
3. Form and grade trench in bottom between first and second.
4. Drain two contiguous pools, on Fitzhugh estate, by sluice through bank and grade in both directions.
5. Open culvert, on Petrie farm, designated structure No. 42.
6. Drain two adjacent pools, either by trench back to fifth, or else by connecting same and by sluice through bank.
7. Drain the series of four pools, on Fitzhugh estate, by connecting same and then by sluice through bank into ditch.
8. Open culvert designated structure No. 40, and grade in both directions.
9. Lower breast wall of spillway, designated structure No. 39, at Keysville, and grade in both directions.
10. Cut through bank and drain into ditch dividing lands of Mr. Wadsworth and E. McMaster, and then grade in both directions.
11. Cut through bank between tenth and Rock Spring aqueduct, and grade in both directions.
12. Lower abutments of Rock Spring aqueduct and grade.
13. Lower abutments of aqueduct designated structure No. 36.
14. Lower breast wall of spillway, designated structure No. 29, and grade in both directions. This is on Chas. W. McNair's estate.
15. Cut through tow path bank between last-named point and the first lock following, and grade in both directions.
16. Lower abutments of aqueduct on Bradner's farm, and grade in both directions.
17. Lower abutments of Canaseraga aqueduct, and grade in both di-

rections, particularly to lock at Cumminsville, designated as structure No. 11, at the foot of which a spring arises.

Between the lock at Cumminsville and the village of Dansville, considerable ditching is necessary for the purpose of carrying away the discharge or overflow of a large spring, which appears in the cellar of the "Allen House" in Dansville, and flows through the abandoned basin and slip into the canal, where it becomes stagnant in the shallow pools caused at the foot of several locks by the scour of the water in the operation of the canal. From information obtained from a number of prominent citizens of Dansville, it would appear that the ownership of the aforesaid slip and basin is in dispute; and hence Mr. Napier expressed himself as not being justified, without specific instructions from Supt. Dutcher, in expending any portion of the appropriation in ditching for the long distance from Dansville to Cumminsville only to dispose of the water overflowing from a private spring. This matter would seem to belong rather to the health authorities of Dansville, and accordingly their attention was officially directed to the question by Dr. Ames.

In respect to the general condition of the canal on this section, from a sanitary point of view, the undersigned would say that only in a few places did it appear as particularly unhealthy, and that any danger might be incurred in carrying out the method of drainage proposed and recommended in the foregoing. More unsalubrious places occur on the line of the main canal between Mount Morris and Kishaqua aqueduct than on the Dansville branch. The former section, however, is in the possession of the Genesee Valley Canal Railroad Company, and neither Mr. Napier nor the undersigned felt authorized to request the officers of said company to commence the work of drainage.

As Mr. Napier could not give more than one day's time to the examination of the canal in Livingston county, the undersigned returned on the following day, after receiving assurance that work on the Dansville branch would speedily be commenced and prosecuted; and a note from Mr. Napier informs me that he intends to begin operations on Monday, July 25th. After a few days required for the proper organization of the work, or about the following Friday, July 29th, he will be ready to accompany Dr. Ames and the undersigned over the line of the canal in the towns of Leicester and York, in said county.

In regard to the approximate cost of the work submitted above, the undersigned is of the opinion that the amount appropriated (\$1,000), for the drainage of the Dansville branch, will, if judiciously expended, be more than sufficient; and Mr. Napier hopes to be able to leave a handsome balance for expenditure in other localities.

Respectfully submitted,

EMIL KUICHLING, *Civil Engineer.*

To the State Board of Health of New York:

As your local agent I would respectfully report in respect to the drainage of the Dansville branch of the abandoned Genesee Valley canal.

The work was delayed until the month of August last, when, under the direction of Mr. William Napier, in behalf of the Department of Public Works, it was begun.

That portion of the above described canal beginning at the junction

with the main canal at the Shaker settlement, in the town of Groveland, south-eastward to about one mile north of the village of Dansville, has been about three-fourths of the distance completed, to the full requirement of sanitary conditions.

The bed of the canal and the standing pools have been well and sufficiently drained by ditching and opening sluices for the water to pass into the former and natural water-courses.

The portions passed over and left undone, north of Cumminsville, have been thus omitted because of objections to the work by the owners of lands through which the canal passed.

These omissions will work injustice and injury to other land-owners who have willingly allowed the openings to the natural water-courses with the expectation and understanding that *all* such water-courses were to be opened, so that no undue surplus water should be allowed to flow upon them.

This is a matter that should be adjusted by some legal steps, so it seems to me.

The work done has removed from the bed of the canal several miles of stagnant surface water and leaves it as dry as the adjacent tillable lands, — which must be a great sanitary gain.

There is now about one mile, beginning at Dansville northwards, that it has been impracticable to drain at present, on account of the work of the removal of the stone from the locks, but should be done before the heat of another summer.

But a very important work remains to be done upon the main line of this canal, which the State has sold to a railroad company.

Nothing has been done in the matter of drainage by such company (and I verily believe nothing will be done by it only as it is compelled by the stern force of the law).

I have examined this canal in company with Mr. E. Kuichling, of Rochester, your civil engineer, from Scottsville, in Monroe county, to the junction near the Shakers, in the town of Groveland, in Livingston county. The extent of water and points of drainage needed, have been clearly pointed out in Mr. Kuichling's report.

I have substantially examined the canal-bed further south from the Shakers to Portage; a portion of it with the health officer of the town of Mount Morris. A large percentage of the whole distance contains water, and is of course malarious in its condition and results.

The owners of this canal-bed should be required to do this work to the satisfaction of the State Board of Health, and also to that of the local Boards of Health through whose towns it extends, and maintain and keep it in a sanitary condition.

This can only be done but by ditching, and opening into the old water-courses, as indicated in Mr. Kuichling's report, so that no standing water shall be allowed to accumulate in any portion of this canal which said railroad company controls.

I transmit herewith the action taken by town Boards of Leicester and Mount Morris.

The chief engineer of this railroad company was notified by me of the action of the town Board of Health of Leicester, but of course nothing was done.

Respectfully,

L. J. AMES.

MOUNT MORRIS, N. Y., *October 3d, 1881.*

It will be seen that the objections made by certain real estate owners to complete the drainage work on the Dansville branch of the abandoned canal bed were not overcome by the local authorities, and that some drainage work remains to be completed, when the necessary assent is obtained, or to be required as soon as the local transfer of such property has been made to the citizens, whose estate is contiguous to the late canal.

REPORTS AND ACTION RELATING TO MIASMATIC SECTIONS OF THE
ABANDONED CANAL, NOW OWNED BY THE RAILROAD CORPORATION.

There seems to be no doubt that so long as the Genesee Valley canal continued to be used as a navigable waterway, it facilitated rather than impaired the sanitary drainage of the Genesee and Canaseraga valleys, and it is still more certain that its abandoned prism, by obstructions to, and other effects upon the natural water-courses, has resulted in a serious increase, or intensifying effect, of miasmatic conditions in a great number of places. The annexed statements which have been made to this Board by the local Boards of Health of Mount Morris, Leicester and York, and the annexed report by Emil Kuichling, C. E., show ample cause for the final report which this committee made to the Governor by authority of the State Board.

I, F. M. Joslyn, clerk of the Board of Health of the town of Mt. Morris, Livingston county, N. Y., do hereby certify that the following is a true copy of a resolution adopted by the Board of Health, in and of the town of Mt. Morris, at a meeting thereof, held September 27, 1881: "Resolved that the whole abandoned Genesee Valley canal, situate within the limits of the town of Mt. Morris is, and is hereby declared by this Board to be a nuisance."

F. M. JOSLYN,
Clerk of the town Board of Health.

MT. MORRIS, N. Y., Oct. 1, 1881.

Dr. AMES, of Mt. Morris, N. Y.:

Sir.—The undersigned, composing the Board of Health of the town of Leicester, would respectfully submit that they have examined the bed or prism of the Genesee Valley canal (so called), from the Genesee river (the town line south), to the town of York, and find more or less stagnant and bad smelling water along the whole line, but would especially call your attention to that portion at "Tracey's basin," now known in this section as "Wooster's basin." At this point from the peculiar lay of the land west of the basin which descends to, and makes said basin the receptacle of water which does not find any outlet, and therefore, especially at this season of the year, makes filthy, stagnant and bad smelling water, which is detrimental and dangerous to the health and lives of those living in close proximity, and also to a greater or less extent to the whole town.

We would also call your attention to two or three dams or bars which have been put across the canal at points north of said basin. The dams obstructing the natural flow of the water in the prism of the canal make it stagnant and filthy.

The Board would respectfully urge such remedy of these evils as may lie in your power with the promise of coöperation on our part.

Respectfully,

J. S. WHEELOCK,
JOHN WHEELER,
G. W. LANE,

Justices of the Peace.

DORIES THOMPSON, *Supervisor.*

F. H. MOYER,

A. M. WOOSTER, M. D.,

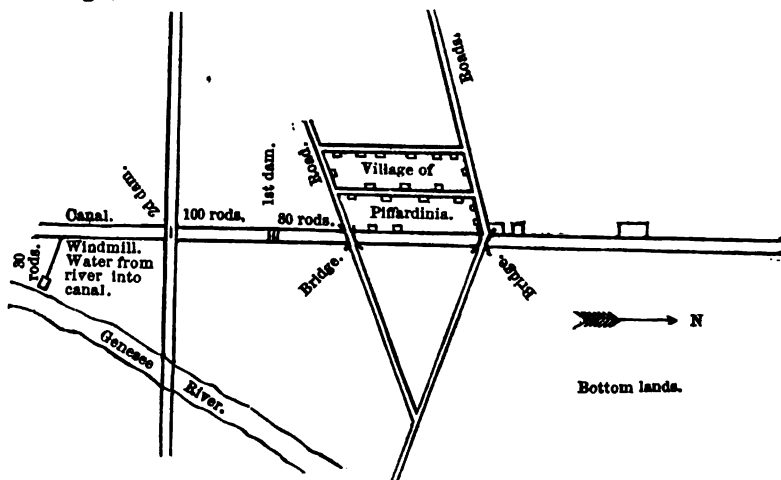
Health Officer.

YORK, LIVINGSTON COUNTY, N. Y., }
June 30, 1881. }

To the State Board of Health:

SIRS:—In your reply to a petition of the citizens of Piffard, in the town of York, you requested to have said reply presented to the supervisor of the town, which reply was duly received by me as supervisor. You therein requested that the town Board of Health convene and act as provided by the law for organizing boards, etc., and to have a chart and description of pools of stagnant water sent to State Board.

Previous to the receipt of your letter we had organized a town Board of Health and had looked the ground over, and from that inspection the following sketch is made. Of course distances are estimated. North



of the village of Piffard to the north line of this town (York) there is as yet no complaint of malaria.

At Piffard there seems to be a considerable deposit of sediment and water at the north end of the village, near Kendall's saw-mill, with water through the village in small detached puddles, which at that time seemed to be rapidly drying up. From the canal bridge at the south end of the village to dam placed across the canal by the owner of adjacent lands, about 80 rods, the canal was dry, no water to be seen. Above the dam the water appeared about 2 feet deep. He had there pierced the heel-path with an iron pipe through which was running a 2-inch stream. On the tow-path side there was also a like discharge into watering troughs. This reservoir set back about 100 rods to where the

canal has been filled in for a highway bridge. The upper reservoir is supplied with a force-pump at the river, distant about 30 rods, driven by a turbine wind mill.

We learn from a resident director of the Genesee Valley Canal Railroad that the Railroad Co. will aid in work directed by the State Board of Health.

(Signed)

A. D. NEWTON, *Supervisor.*

With this testimony and a complete report, in detail, upon the engineering facts in the proposed drainage, the Board made its report to the Governor.

The Governor's action upon the report thus submitted by the Board is shown in the following order:

COPY.

To the President and Directors of the Genesee Valley Canal Railroad Company, and others whom it may concern:

Complaint having been made to me of the condition of the abandoned Genesee Valley canal, its banks and prism, which has come into your possession and ownership for railroad purposes, as affecting injuriously the public health, and as dangerous to life; which said complaint having been duly referred to the State Board of Health for examination and the said State Board of Health having fully inquired into the facts, and made report thereon, declaring, among other things, "that they find the late Genesee Valley canal at various places between Scottsville, in the county of Monroe, and Kishaqua creek, or the Shakers, so-called, in the county of Livingston, is a nuisance; and that it should be speedily well drained, so that it shall cease to be a source of miasmatic disease." Now, therefore, in accordance with the statutes in such case made and provided, and the authority conferred by chapter 322, sec. 8, of the laws of 1880, the matters and things found and certified by the State Board of Health, as to the condition of the abandoned Genesee Valley canal—its banks and prism—are hereby declared to be a public nuisance; and the same is hereby ordered to be changed, abated or removed by the Genesee Valley Canal Railroad Company, its president and directors, as herein more specifically set forth, to wit: That the said abandoned canal be drained for the distance of twenty-nine miles, lying between Scottsville, in the county of Monroe, and Sonyea or Kishaqua creek, at the aqueduct by the Shakers, in the town of Groveland, county of Livingston, as marked in the schedule of the canal levels herein described, viz.:

TABLE SHOWING RELATIVE LENGTHS OF GENESEE VALLEY CANAL CONTAINING STAGNANT WATER BETWEEN SCOTTSVILLE AND SONYEA.

Section.	Total length— miles.	Length con- taining water, miles.	Length com- paratively dry, miles.	Remarks.
From lock No. 3 to lock No. 4	8.64	7.40	1.24	Scottsville to Canawaugus.
From lock No. 4 to lock No. 5	2.10	0.10	2.00	Canawaugus to Sackett's Basin.
From lock No. 5 to lock No. 6	5.10	3.00	2.10	Sackett's Basin, south.
From lock No. 6 to lock No. 7	8.16	3.16	5.00	Piffardinia and Clayville level.
From lock No. 7 to lock No. 8	1.00	1.00	0.00	Genesee river, north.
From Mt Morris to Sonyea	4.00	3.00	1.00	Genesee river to Kishaqua creek.
Total	29.00	17.66	11.34	Miles.

That such drainage be so made as to remove and hereafter prevent the accumulation of water or silt where found constantly covering the bottom of the canal prism, and that such drainage be made in the most feasible and practicable manner possible, according to the condition of the case in the locality to be drained. And it is further ordered that the natural streams, valleys, and ravines near to or crossing the said abandoned canal be so kept clean of obstructions at and within the abandoned canal limit as not to produce stagnant ponds or silt to the detriment of the public health, all of which drainage and other work attendant upon the removal of matters and things complained of, to be made and done before the first day of April 1882.

In all and singular respects as to which work for the removal or abatement of the nuisance hereinbefore referred to, the State Board of Health, and Superintendent of the Public Works, will, where practicable, co-operate.

[L. s.]

(Signed,)

A. B. CORNELL, *Governor*.

Dated, *Nov. 1st, 1881.*

The Governor's order as quoted was served upon the president of Genesee Valley Canal Railway, on the 3d of November, and it is said by the attorney of the railroad company that the order will be complied with in good faith.

A malarial region on the Hudson river-front of the town of Cortland.

Members of the family of the late Col. C. have since the 16th of November until the end of the year 1880 and onward continued to urge that general sanitary measures should be adopted for the prevention of miasmatic diseases from which they were suffering in the immediate vicinity of Oscawana Island, and which, by the families chiefly concerned, are attributed to the stagnant ponds that separate this island from the main land which in later years, since the filling of the embankments of the Hudson River Railroad, have been cut off from all "tidal scour" of the Hudson river.

Formal petitions by numerous inhabitants have been filed during the spring of 1881 asking for the advice and direction of the State Board of Health concerning this matter; the Secretary inspected it during the month of May, and having obtained the services of engineer J. J. R. Croes, that gentleman made a report of which the following is an abstract:

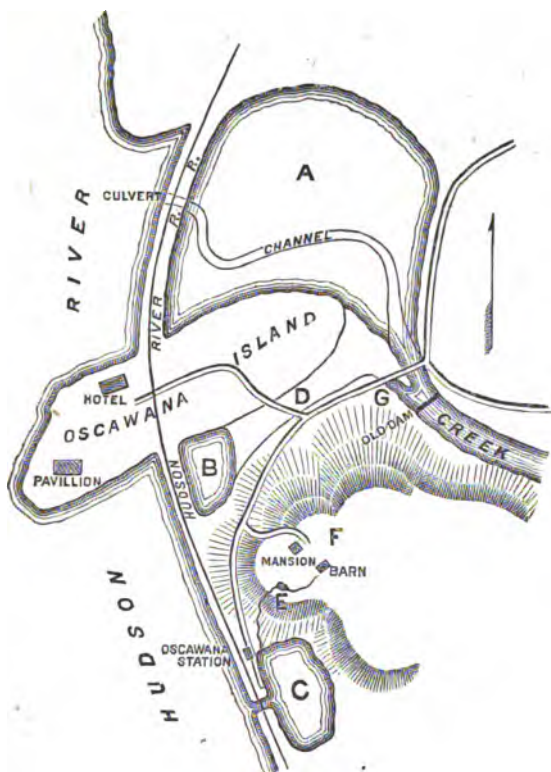
ENGINEER CROES' REPORT.

NEW YORK, *June 13, 1881.*

To the State Board of Health:

Under your instructions I visited Oscawana Island and Cortland station on the Hudson river, in Westchester county, on the 11th inst., and examined the alleged sources of malarial disease, and conversed with the principal families in that region.

The accompanying sketch, which is not made to scale, no map being at hand, gives a general idea of the localities.



The pond *A* is for the most part above low water mark, and except in the channel, presents at low tides a large expanse of mud flats.

The pond *B* is closed to the river, and is fed by surface drainage from the high lands on each side. There is probably a slight percolation through the railroad embankment, one way or another according to the relative height of the pond and the river.

The slough *D* was once evidently an open channel. It has been silted up for many years; there is a thick growth of under brush and small trees in it, but it is now a bog of black muck full of standing pools of water.

The hillside from *B* and *D*, toward *F*, rises very steeply and is thickly wooded, as is also the slope from *F* toward *C*. The space around and in the rear of the mansion on top of the hill is cleared.

South of the mansion and near the barn, several springs appear which form a stream. On this little stream, at *E*, there is a small pool, the bottom of which is a bed of black decomposing vegetable matter.

Near *F*, in the rear of the mansion, there is every indication of a pocket in the rock, creating a saturated subsoil.

C is a pond formed by the railroad embankment across a small bay. Part of the area is bare at low tides.

At *G*, where a causeway has obstructed the streams partially, there is a cove bare at low water, and with a black muck bottom.

Oscawana Island rises very high, and the railroad crosses it by a tunnel. I think that the ponds *A* and *C* in their present condition are unhealthy. I am not so sure about the unhealthiness of *B*. The slough *D* is unhealthy. I am satisfied that a part at least of the malaria at the C. mansion proceeds from defective subsoil drainage near the house, and on top of the hill.

The trouble from malaria, experienced two or three years ago on Oscawana Island, resulted from the total change of life and habits, caused by the family's removal from the city to a new house in the country, with the complete *upturning of the old soil* around the place in the progress of the improvements then being made, rather than by the ponds *A* and *B*.

I would recommend:

1. That the culverts from *A* and *C* to the river be dammed to about two feet above low-water mark.
2. That a culvert be made in the railroad embankment at *B*, with its bottom two feet above low water.
3. That a ditch be dug through the slough *D*, to make free communication between *B* and the creek channel.
4. That the cove *G*, be filled above high tide level with sand.
5. That the low ground around *A* be not cultivated or upturned.
6. That the stream and pool *E* be cleaned out.
7. That the ground around the C. mansion, particularly the hollows to the east and south-east, be underdrained.

Respectfully submitted,

J. J. R. CROES, *Civil Engineer.*

June 26, 1881, Commissioners Brooks and Harris, in company with the town Board of Health of Cortlandt, inspected the nuisances in the vicinity of Oscawana Island, with engineer Croes' report in hand. All points and recommendations in the engineer's report, were concurred in by a majority of the local Board, with one point excepted for the present, namely; that instead of draining the slough towards the creek, it seemed to be preferable to drain the southern half at least, into what is known as the "fresh water pond;" as soon as that pond shall have been culverted to receive the "tidal scour" of the Hudson. The proprietors upon whose lands and premises these improvements are required, were present. Though an opinion had been expressed that the so-called "fresh water pond" ought not to be connected with the Hudson, yet, until within a few years past, it was merely an elbow or bay — there remains no doubt that the culvert and "tidal scour" should be provided for. It is not a fresh water pond, but a slimy pool. The northern half of the slough will in all probability be successfully drained, into the creek, that makes its way to the Hudson through Mr. De G.'s property. The latter gentleman promised the officers of the local Board of Health, while upon the premises on this inspection, to carry out in full all the recommendations made in the engineer's report. All his lowland property, comprising some thirty acres, is upon the northern and western margin of the slough and creek.

Miasmatic Nuisances at Croton Falls.

Upon the petition of numerous citizens of Croton Falls, confirmed by a sanitary map prepared by physicians of the village, this committee

visited Croton Falls, attended by a civil engineer, who made the following report, illustrated by a map here appended marked "F.," and diagrams "ff."

NEW YORK, June 13th, 1881.

DR. ELISHA HARRIS, *Secretary State Board of Health* :

SIR : — I have the honor to submit herewith a sketch of the village of Croton Falls, in the town of North Salem, Westchester county, with the location of the several probable causes of diseases indicated thereon by figures and explanatory notes, as examined in company with you on the 4th inst.

The nuisances may be classed under these heads :

1. Those which tend to pollute the Croton river, including Nos. 2, 5, 6, 7, 8, privies which are either directly over the water or on the sloping bank without vaults, and No. 9, a slaughter-house, which discharges its refuse into the stream.
2. Those which are offensive to the smell and pollute the atmosphere, without directly affecting water supply. These are Nos. 3 and 10, slaughter-houses not properly cared for.
3. Those which unquestionably affect the ground and water of adjacent wells, and poison the air and the water. These are Nos. 4, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and possibly 26.
4. Those which produce malarial vapors from soil saturation. Nos. 11 and 12 ; the hollow on the east side of the Harlem railroad embankment is of this class.

The nuisances of the first class appear to me to be offenses against the general health, and ought to be abated at once by the removal of privies and slaughter-houses from the bank of the river, or any point where their contents can reach the stream.

The nuisances of the second class can be abated by a very little attention to cleanliness and a removal of refuse, under the direction of the local authorities.

The nuisances of the third class are of the most serious character, as affecting the health of nearly every house in the village. It is hardly possible that the water of any of the wells examined can be fit to drink.

It is difficult to suggest a complete remedy for these evils without more thorough examination and consultation with the people, than has yet been. A general outline of what should be done may be given as follows :

a. Extend the present partial system of water supply from remote springs to as many houses as possible.

b. Thoroughly cleanse and disinfect all privy vaults.

c. Remove all privy vaults to at least fifty feet from wells, and place none on ground higher than the wells.

d. Compel the frequent cleansing of all such vaults, and the covering of their contents with clean dry earth, frequently while in use.

e. For the two blocks of houses east of the railroad, on high ground, a pipe sewer might be laid to remove all slops, etc., entirely, to the meadow land south of the village, there to be disposed of by irrigation.

f. Thorough ventilation of cellars.

The fourth class of nuisance is found only in one locality and is produced by the railroad embankment. A tile drain should be laid on the line and grade designated on the accompanying sketch, No. 2, and a slight ditch made as shown, for about 250 feet, at the foot of the bank,

to carry surface water of storms to the culverts. Care should be taken to see that this ditch is always kept unobstructed.

All of the above work can be done inexpensively and under the direction of an intelligent health officer ; except, that if any sewerage is undertaken, the advice of a competent engineer should be obtained and followed.

Respectfully, your obedient servant,

J. J. R. CROES, C. E.

A copy of this report was presented to the supervisor and medical gentlemen of North Salem, and a conference was held with the physicians who were in attendance from each four towns whose contiguous corners comprise the hamlet of Croton Falls. The authorities in each of the towns concerned were advised to organize their respective town Boards of Health.

A miasmatic stench nuisance in New Rochelle, Westchester Co.

The following petition, signed by Albert Smith, M. D., William Askew, Charles Higbee, John Dillon, and nearly one hundred others, to Governor Cornell was referred by him to this Board, June 8, 1881 :

" To his Excellency ALONZO B. CORNELL,

Governor of the State of New York :—

The undersigned, residents of the village of New Rochelle in the county of Westchester, and State of New York, respectfully present the following for your consideration :

That a great public nuisance exists in the aforesaid village, caused by refuse and waste material being allowed to run from the New Rochelle Brewery into a stream of water known as "Burling brook," which has its head waters near the center of the village, and thence runs nearly a mile through the village until it empties into the waters of Long Island Sound, causing vile and pestilential odors to fill the atmosphere for a long distance on each side of the stream, and causing much sickness and malarial diseases.

And your petitioners verily believe that the said nuisance should be abated at once, in order to preserve the health and lives of the inhabitants of this village.

Your petitioners, therefore, pray that the State Board of Health may be required to examine into the facts set forth above, and that such steps may be taken as to the same as are provided in and by chapter 322 of the laws of 1880.

All of which is respectfully submitted. "

To this was appended the following memorandum, signed by Drs. Wells, Pryer, and Huntington, well-known physicians.

" The undersigned, practicing physicians of New Rochelle, hereby certify that we believe the condition of the brook referred to in the foregoing petition to be a nuisance detrimental to the health of the community."

After careful inspections, the report hereto annexed (marked C) from J. J. R. Croes, C. E., was made. Thereupon the committee reported its conclusions to the Governor in the following terms :

" The committee finds it a duty to report to your excellency that the nuisance as herein described and consisting of the outflowing matter from the said brewery, its stables and appurtenances, should be abated and wholly prevented so that it shall not in any manner pollute the at-

mosphere in the village and vicinity of New Rochelle, and that in whatever manner and to whatever place the said outflowing of waste matter shall be conveyed, or made to flow, to tide water, or elsewhere, it shall be so conducted that it shall not endanger the health of the inhabitants on shore."

["C"]

NEW YORK, Nov. 28, 1881.

To the State Board of Health, N. Y.:

Under your instructions I visited New Rochelle, on the 18th inst., and examined the disposal of the washings of the wash-tubs and yeast casks and floors of Jones' brewery. The waste water which is very offensive and contains the decomposing refuse is carried by a drain to three tanks 12 x 14 feet, and after partial settling, flows into the brook which runs through the lands of several owners for about 8150 feet, emptying into a small bay of Long Island Sound at Pelham post office. The refuse causes bad odors all along the bank and then is deposited on the mud flats along the bay which are bare at low tide. The accompanying diagram shows the position of the brewery, and the tanks, and the course of the refuse.

Respectfully, your obedient servant,
(Signed,) J. J. R. CROES.

Inspection of a water-side hotel and summer resort, by a sanitary engineer and the committee.

June 28th, the president of the Board of Health of New Brighton sent the following telegram: "Please, will the State Board of Health supply a sanitary engineer and inspector, to make an examination of the — hotel. Diphtheria has broken out." To this the following reply: "I will call on you and the Health Officer, at the residence of the latter with a sanitary engineer, at 9:30 A. M., July 2."

(Signed) E. HARRIS.

At the appointed hour, the Secretary of the Board accompanied by Mr. T. J. Nealis, sanitary engineer of the Health Department, New York city, met the president and Health Officer of New Brighton, and proceeded to make a careful inspection of the hotel. The details of the inspection were duly recorded by the local Board of Health. It resulted in the following orders, made before leaving the premises the evening of July 2, after the formal statement by the sanitary engineer, of what would be required in each particular.

"Upon results of inspection by the local Board of Health of New Brighton, and sanitary engineer Thomas J. Nealis, and the Secretary of the State Board of Health.

Resolved—That the proprietor of the — Hotel be directed to carry out the following precautions and repairs which are reported to this Board as essential for the protection of health:

1. To empty, disinfect and cleanse the receiving-vault in the basement at the head of main sewer, and the pipes discharging therein.
2. To remove all obstructions from sewers.
3. To ventilate receiving-vault by a six-inch pipe, carried above the highest point of the roof.
4. To have the flag stone over the receiving-vault laid in cement.

5. To provide a trapped-sink in place of the open slop grating which discharges into receiving-vault.

6. To have the servants' water-closets in basement either wholly renewed, or placed and kept in proper sanitary condition. To disinfect and remove all filth from ground under seats.

7. To thoroughly disinfect and cleanse and ventilate basement, removing the flooring and soaked woodwork around water closets.

8. To place stench traps in waste-pipes directly under all untrapped fixtures, and to have all slip-joints made tight.

9. To have ice boxes disconnected from sewers and made to discharge into trapped safes.

10. To have all openings from surface of basement into sewers effectually closed.

11. To effectually repair sewer from ice-house and trap it so that no gas can escape into house.

12. To continue the soil pipe in each wing, at its full calibre, up to not less than two feet above the roof.

The execution of the work was commenced at eleven P. M., the same evening, July 2nd, and resumed at four A. M. Monday following, continuing until the entire work was satisfactory. The proprietor has expressed to the Secretary of the State Board his approval and thanks, though the language of the order was peremptory. At the date of inscribing this record, we add by authority of the health officer of New Brighton, that the sanitary improvements here described became the certain means of exterminating and preventing causes of sickness which threatened to depopulate, and keep depopulated, this great establishment which has contained from three to five hundred persons from June till late in October. The proprietor of his own part has undertaken to carry out still more extensive improvements in view of the results that have followed these orders of the Board of Health. He has assured the Secretary of the State Board, that the employment of a competent sanitary engineer at the time of his inspection was, in his judgment, of the highest importance.

SPECIAL REPORTS ON SYSTEMATIC DRAINAGE OF EXTENSIVE SWAMPS THAT CONTRIBUTE THEIR WATER TO THE ERIE CANAL.

NOTE.—The correspondence of the State Board of Health and the advice required by local authorities in the towns and villages that are situated in the vicinity of extensive swamps, have proved to this Board that it is a duty to begin systematic inquiry and labors which shall result in securing the sanitary drainage that the inhabitants of separate towns and villages cannot of themselves alone secure.

The Board invited to its assistance in beginning its inquiry in this field, Mr. Emil Kuichling, a civil engineer, whose special familiarity with certain swamp areas in Western New York, and whose professional ability would insure the proper commencement of needed investigations and systematic efforts in a region where the rights of the State to take and control the waters of the great swamps are well known. The great swampy basins or watersheds of the Tonawanda and Oak Orchard creeks which comprise portions of Erie, Niagara and Genesee counties, offered the first field for inquiry. Engineer Kuichling's preliminary statements are now presented without any technical details; as the health and future welfare of a vast population will be largely dependent upon suitable drainage of the swampy regions he has begun to describe,

this paper is submitted to the public as a kind of information much needed. Other malarial swamp regions are sure to be examined by local as well as the State authorities, and the true significance and share which swamps and water-soaked regions have in the natural history of miasmatic diseases and the failures in prosperity or progress become correctly understood.

Salubrious and opulent as this State is, there is a vast quantity of malarial swamp that should be reclaimed from its present *injurious* condition, even if the prospective values of such drained areas did not promise — as, fortunately, they do — to repay the full cost for such improvement.

In the geological survey of the State, Prof. Mather found there are about 125 square miles of salt marsh regarded mostly as reclaimable. Extending our inquiry inland, we find that the interior and western counties have extensive marshes and swamps which are far more damaging to the public health than any of the tidal marshes can be; and at the same time the value of reclaimed swamps like those of Genesee and Niagara counties vastly exceeds that of drained salt marshes. In alluding to the paramount importance of sanitary drainage in the inland regions, we would invite attention to the extent of these miasmatic areas. The swamps of Orange and Ulster counties amount to nearly 25,000 acres; the drowned lands of Orange amounting to about 15,000, and nearly all being capable of complete reclamation as rich fields that might be kept free from malaria when drained. The swamps in Madison and Oneida counties comprise nearly 22,000 acres, including the swamps around and west of Oneida lake. The Cayuga and Montezuma marshes have a total area of about 60,000 acres. The swamps in the several towns between Clyde river — in four counties — Wolcott creek and the Genesee river, cover 20,000 acres and upwards, the Tonawanda swamps in Niagara and Genesee counties cover upwards of 22,000 acres, and a continuation of those swamps and water-soaked basins in Orleans county, eastward, and Erie, westward, makes up fully 10,000 acres more. The summit swamps and wet lands, beyond all these, cover about 100,000 acres. These 259,000 acres, and more, of swamp, are generally miasmatic and the cause of unhealthfulness for considerable distances beyond their borders; and as the undrained wastes of Orange, Genesee and Niagara counties are at once the most miasmatic and — prospectively — the most productive and habitable of great swamp areas in the State, they may properly be first reported upon with reference to systematic drainage.

E. HARRIS, *Secretary*.

PUBLIC COMPLAINT OF MALARIA IN THE REGION OF EIGHTEEN-MILE CREEK, NIAGARA COUNTY.

Upon complaint of numerous inhabitants in the town of Hartland the past two summers, the supervisor of that town was requested to secure the organization of the local Board of Health for the purpose of giving all necessary attention to the matters complained of. That Board was immediately organized on July 19, and reported the results of its investigations. As several hundred persons have petitioned that the State should interfere in this case, the following abstract of the report of the local Board of Health is here given to show in few words what its judgment is upon the subject: "We find that the Eighteen-mile creek

is mostly an artificial stream; that its original sources have disappeared with the improvement and cultivation of the country, and that if not fed by water from the Erie canal, would be a dry bed except during a short time in the spring and fall; that the stream is, and has been for years, maintained by water from the Erie canal; that the overflow into it is frequently in excess of the capacity of the creek bed, causing at points an overflow of water which sets back into low places. The water subsides, the submerged grounds dry up, and at times there are stench emanating from these places. We are of the opinion that if the waters were kept within proper limits there would be no emanations from the creek of a hurtful character. The regulation of this water being in the hands of the canal authorities, the condition of the creek is wholly within their control and dependent upon their action."

The President of the State Board, attended by the local Board of Health and Messrs. E. Kuichling and Holmes, civil engineers, inspected the region complained of, and found that the statements made by the local Board are fairly sustained, and that most of the evils complained of by the inhabitants could and should be overcome by their own action, under the advice of the town Board of Health; that the obstructions in the sluggish water of the Eighteen-mile creek have more to do with its overflow and the unsanitary conditions of its margins, than the spillways and overflowing of the Erie canal, and that when the inhabitants are ready to do their share of the work, the State should do what is necessary to govern the course of overflow from the waste-weirs and spillways.

SENECA LAKE OUTLET, SENECA LAKE-LEVEL, GENEVA, WATKINS AND HAVANA MALARIA.

In accordance with the action taken at the meetings of the Board April 16th and May 10th, the President was directed to authorize such action by the committee on Drainage, Sewerage and Topography, as should secure the best results for repressing the causes of malaria in the region of the abandoned canals, and in regard to the Seneca lake level and its outlet.

In pursuance of this duty much information was obtained, a conference of citizens of Geneva and its Board of Health was held, and a personal inspection made through the entire district. It was ascertained that important legislation relating to Seneca lake level was pending, consequently it was inexpedient to publish the information obtained unless it should be called for by the Board or the legislature. The chief results of the investigation pursued by the President and Secretary showed that extensive sources of malaria caused by an imprudent interference with the level of Seneca lake, and with a natural degree of uniformity of outflow from it (brought about by the law of 1857 and otherwise) will need to be removed and prevented by the State. The fact appears that by greatly widening and deepening the outlet of the lake in 1857 in the expectation of improving the Seneca canal navigation, the lake level is so rapidly lowered in the early summer, that extensive shore and muddy margins in front of Geneva and Dresden and some other portions of the lake shore became miasmatic, and remain so during the entire season until the autumn high-water period. At the

same time the lake outlet, for a distance of nearly seven miles, acquires a miasmatic condition through a populous district. The excessive lowering of the lake level, seems, in the judgment of these officers of the Board, to have afforded no compensating advantage, even to the Watkins and Havana flat-lands at the head of the lake, the only region that derives any other than injurious results from the operation of the law of 1857, permitting such lowering and waste of the lake water.

The officers of the Board thus recording one of the results of their investigation are not unmindful of the fact that from 1790 to the present time the questions affecting the level of this, the most beautiful of all the lakes in the State, with its nearly ninety miles of naturally healthful border country, and seven or eight miles of outlet, have been quoted from time to time to the legislature in connection with various projects for changing the lake level.

There appears to be no doubt that the sanitary interests of Watkins, and Havana and the region of great resort at the "Glen" should be fully protected by the same authority that protects the sanitary interests at Geneva, Dresden and the Seneca outlet. The whole subject of this lake-level and the natural rights that pertain to watersides and to any hydraulic franchises in connection therewith, and in whatever way they are claimed, will have to be determined by the State. Such final settlement of the questions and rights now at issue will require that the engineering problems be clearly defined and correctly reported upon, and that this be ordered by the State, and the result be based on sanitary grounds.

MIASMATIC DISEASES IN EIGHT FARMHOUSES FROM A SMALL SWAMP.

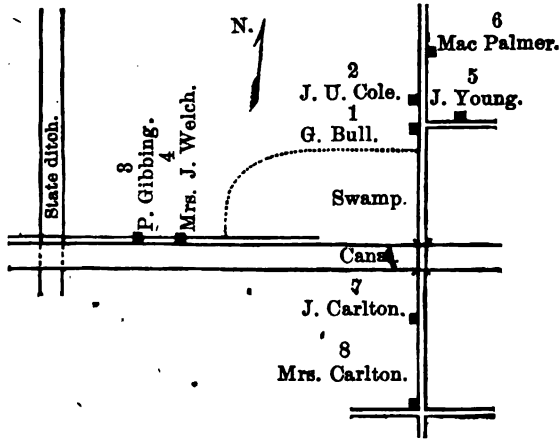
Investigation of a swamp nuisance in Murray, Orleans county.

The subject having been brought to the attention of the Board by the Hon. M. H. Phillips, the Secretary was instructed to obtain information directly from the physicians of that neighborhood. On the 12th of April the Secretary inspected the locality in company with engineer Radenhurst of the State Engineer's Department. The following memorandum from the engineer's report shows what was the nature of the evils complained of:

"This pond comprises about twenty-three acres, and consists of a basin eroded by glacial action upon the rock of Medina sandstone, and which since the canal improvement, twenty-five years ago, has been deepened and extended by the tow-path embankment. The border upon the swamp is a shallow, muddy bed, and the greatest depth does not exceed a few feet. It is in the midst of a rich farming district, and most of the homesteads near it are upon high sloping grounds."

Dr. Taylor's report to the Secretary on sickness in this region illustrates the importance of local causes of miasmatic diseases.

"I have made out this statement of different families who reside around this swamp basin who have suffered from miasmatic diseases in the year 1880:



No. 1 (six in family) four had intermittent fever; three had dysentery.
 No. 2 (four in family) one had malarial fever, and all took preventives.

No. 3 (three in family) all had malarial or intermittent fever.

No. 4 (five in family) four had intermittent fever, repeated attacks.

No. 5 (five in family) two had dysentery which was malarial in its nature and causes.

No. 6 (five in family) three had intermittent fever, repeated attacks.

No. 7 (four in family) three had dysentery; one intermittent fever.

No. 8 (six in family) two dysentery; three intermittent fever.

These eight families live within less than half a mile of this swamp-hole, and are distributed around it as shown in the annexed diagram. The cases of dysentery, I consider, were caused by the unhealthy pool, that produced the malarial sickness. The inmates of every household suffered more or less from malarial disease."

A PRELIMINARY REPORT, by ENGINEER E. KUICHLING, RELATING TO DRAINAGE OF THE TONAWANDA SWAMPS.

To the State Board of Health :

In accordance with instructions received a short time ago from your Board to prepare a statement describing the present condition and character of the Tonawanda swamps, with the view of both improving the public health in these localities and also rendering large areas available for cultivation, the undersigned would herewith respectfully submit the following report :

The presence of extensive swamp districts in a country or State is a disadvantage of no slight significance, and one that should receive the most careful consideration both from the government and society in general. Such lands not only produce no appreciable revenue, but are unprofitable, if not totally useless to their owners. They are also sources of direct loss through their miasmatic emanations, which render a large adjacent territory extremely unhealthy and sometimes absolutely uninhabitable. Even if an agricultural population can be induced to brave the dangers of malaria and settle upon the marshy soil without

possessing the means to effect its drainage, their impoverishment and demoralization is sure to follow. The history of agricultural engineering in Europe records many pitiful instances of the complete pauperization of the inhabitants of swampy districts, and hence from both social and sanitary considerations, land drainage should be classed with the most important interests of human society.

Throughout the State of New York there are distributed a great number of areas of marshy land which, from the date of the earliest settlements in the vicinity up to the present time, have been recognized as sources of malaria and disease. The most extensive and important of such tracts in the western portion of the State are the *Tonawanda swamps*, which formerly extended almost without interruption for over fifty miles along the boundaries of Genesee, Orleans, Niagara and Erie counties, from a point between the villages of Batavia and Albion to the Niagara river. These swamps originally covered a much larger area than at present, particularly in the western district, where many separate parcels of land have since been partially drained at different times and by different engineers. In consequence of such improvements having been executed without reference to a comprehensive plan for the drainage of the entire region, it now becomes difficult to discriminate sharply between the areas which are used for agricultural purposes, but are not sufficiently dry to be called salubrious, and those which still retain an unmistakable swampy character, and therefore no definite statement of the area of unhealthy land or marsh can be made without exhaustive surveys and investigations. From various sources, however, I have learned that the aggregate territory, which is either imperfectly drained or else positively swampy, and which is actually included in the tract under consideration, may fairly be estimated at from forty thousand to fifty thousand acres.

The surface of the whole low district is generally quite even, and presents the appearance of a long and comparatively narrow plane, having a nearly uniform fall or declivity of about one and one-half feet per mile towards the west. From this plane the ground rises gradually on each side until it meets the strongly defined ridges or terraces bordered by wide table-lands, which extend almost continuously in an easterly direction through the southern portions of Niagara and Orleans counties, and the northern portions of Erie and Genesee counties, and which thus mark the edges of the main hydrographical basins containing the swamps. The entire territory is divided into two principal drainage areas by the two natural outfalls afforded respectively by the Oak Orchard and Tonawanda creeks; and for the sake of convenience, each of these areas will here be distinguished by the name of its own outfall.

The eastern, or Oak Orchard creek, basin lies in the counties of Orleans and Genesee, and has a total drainage area of about eighty thousand acres, with an outlet through Oak Orchard creek northerly into Lake Ontario, while the western basin lies in Niagara and Erie counties, and has a considerably larger drainage area with an outlet through Tonawanda creek westerly into the Niagara river. The swampy district of the former basin covers parts of the towns of Alabama, Byron, Elba and Oakfield, in Genesee county, and parts of the towns of Barre, Clarendon and Shelby, in Orleans county; and extends over an area

about twenty miles long, and from one to four miles broad, containing about twenty-five thousand acres. In the western basin imperfectly drained and marshy land is still found on both sides of Tonawanda creek, in the towns of Royalton, Lockport, Pendleton and Wheatfield, in Niagara county, and in the towns of Newstead, Amherst, Clarence and Tonawanda, in Erie county, the aggregate area of these lands amounting to about twenty thousand acres.

The figures given above are based upon the statements of prominent citizens of these counties who have long been familiar with the swampy districts, and have given much time and study to the subject of improvement.

It is greatly to be regretted that accurate data giving the exact area at present covered by marsh and partially drained land in each of the above-mentioned towns are not available, in order that the sanitary and social conditions might be compared and the real effect of the swamp upon the population thoroughly studied; but, as much of the unimproved land in the several towns is known to be located either directly in the marshes, or else upon their borders where the soil is too moist for cultivation, a rough estimate of the significance of these swamps may perhaps be obtained from the statistics of the State census for the year 1875. From this source the following table, showing the relative areas of improved and unimproved farming land in the whole district, together with the population in 1865 and 1875, etc., has been carefully prepared.

Statistics from State Census of 1876.

COUNTY.	TOWN.	AREA OF FARMING LAND.			POPULATION.			Remarks.	
		Unimproved land, acres.	Improved land, acres.	Approximate ratio of unimproved to the improved land.	Number of dwellings in 1875.	Inhabitants in 1865.	Inhabitants in 1875.		Increase marked pl. decrease marked pl.
Genesee	Alabama	7,852	19,299	1 to 2½	399	1,839	1,809	— 30	Much swamp and no large village.
	Byron	3,027	16,022	1 to 5	303	1,645	1,595	pl. 51	Very little swamp and two villages.
	Elba	3,723	16,564	1 to 4½	383	2,044	1,537	pl. 107	Much swamp and one village.
	Oakfield	3,540	10,723	1 to 3	314	1,511	1,468	— 43	Much swamp and one large village.
	Total	18,172	62,608	1 to 3½			6,910		
Orleans	Barre	7,154	24,369	1 to 3½	497	6,945	7,593	pl. 988	Much swamp, but large village of Albion and several smaller villages.
	Clarendon	2,871	14,664	1 to 2½	353	1,800	1,585	pl. 42	Much swamp and no large village.
	Shelly	4,569	22,230	1 to 5	796	3,263	3,568	pl. 666	Much swamp, but part of Medina and four growing villages.
Niagara	Royalton	6,888	35,279	1 to 5	1,098	4,901	4,984	pl. 283	Little swamp and several large villa's, as Middleport, Wolcottville, etc.
	Lockport	2,907	27,119	1 to 9	3,219	13,337	13,401	pl. 1,564	Little swamp and city of Lockport, also two or three villages.
	Pendleton	2,679	14,060	1 to 5	788	1,731	1,674	— 57	Much swamp and no large village.
	Westfield	4,239	17,603	1 to 4		3,517	4,167	pl. 660	Much swamp, but part of Tonawanda and five growing villages.
	Total	16,713	94,063	1 to 5½			26,326		
Erie	Newstead	6,983	22,550	1 to 4	727	3,206	3,467	pl. 281	Some swamp and large village of Akron, and other smaller villages.
	Amherst	4,937	25,129	1 to 5	907	4,575	4,800	pl. 225	Some swamp and large village of Williamsville, and four smaller villa.
	Clarence	7,150	24,944	1 to 3½	673	3,610	3,344	— 226	Much swamp and only one large village.
	Tonawanda	1,357	10,539	1 to 8	824	3,040	4,251	pl. 1,211	Some wet land and large town of Tonawanda, besides some small vil-
	Total	19,397	83,566	1 to 4½			15,862		lages.
	Total	71,846	301,440	1 to 4			62,557		

From this table it will be seen that about one-fifth of the whole area of farming land in the above-mentioned fifteen towns was, in 1875, still in an unimproved condition; but just how much of this area lies in marsh, or is only partially drained, the undersigned has had no means of ascertaining. There is, however, abundant evidence that large surfaces of such marshy land in all of the aforesaid towns have been classified by the census officials with other unimproved lands; and as the aggregate area of swampy ground in the entire district has been estimated at from 40,000 to 50,000 acres, it may be fair to assume that at least one-half of the above amount of unimproved land is in such a condition in consequence of the existence of the said swamps. The table also shows that in 1875 the territory specified was inhabited by 62,557 people, most of whom were exposed to the malaria arising from the undrained and wet localities. Of this population, about 26,500 dwell in the city of Lockport and the larger villages of Albion, Tonawanda, Medina, Williamsville, Middleport, Wolcottsville, Akron and Caryville, and about 4,300 in the smaller villages and settlements of Clarence Hollow, Pine Hill, Bergholtz, Gasport, Martinsville, Johnsburg, Pendleton, Millville, South Byron, Orangeport, Shelby, Barre Center, Clarendon, Alabama Center, Royalton and Byron, thus leaving about 31,750 inhabitants in the strictly rural areas of the district. Although a number of these places are situated upon the high table-lands surrounding the hydrographical basins, yet the majority are located in the lower areas, and some, indeed, directly in the midst of tracts which are only partially drained. Under these circumstances, there can be no doubt that thorough and systematic drainage should be considered necessary, and that a great sanitary improvement would result throughout the whole region.

The evil effect of the swamp upon the population is also very strikingly exhibited by the foregoing table, since in every one of the several towns which contains no flourishing city or village, a large diminution in the number of inhabitants during the specified period of ten years will be observed. This circumstance can doubtless be ascribed to the prevalence of malaria and the unproductiveness of the saturated soil on the margins of the swamp. A comparison of the conditions existing in the several towns of Genesee county is especially favorable for proving the correctness of this view. All of these four towns are essentially rural in character, as they have no large and growing villages which tend to concentrate the population. In Byron, which has only a few hundred acres of marshy land, we find an increase of 51 inhabitants, while in the adjacent towns of Elba and Alabama, in which the swamp covers an area of about 9,000 acres, a decrease of respectively 107 and 30 in the population is observed.

From the reports of local physicians and health authorities, it appears that malarial diseases are becoming more prevalent and more malignant throughout the whole of the swampy territory, and frequently, also, extend themselves to the higher lands on each side, so that the importance and necessity of a systematic drainage of this extensive district is becoming apparent to many of the inhabitants. Without entering upon a discussion of the precise character of malaria, it may safely be asserted, in view of recent careful investigations, that:

1. Any organic matter undergoing decomposition in or upon the

ground in consequence of being alternately wet and dry, will generate gases and various chemical and organic products which are either directly injurious to human health, or else will bring about conditions particularly favorable for the development of the subtle poison which is termed malaria or miasma.

2. That this poison is found in large quantities and is widely disseminated through the soil of malarial districts at a season when people are not yet attacked by disease.

3. That at these times the poison may also be found in especially favorable places in the strata of air nearest to the surface of the infected ground.

4. That under certain conditions of the atmosphere, the poison is liberated in large quantities, whereupon it is taken up by the air and distributed over a large extent of adjacent territory, thereby generating peculiar diseases among human beings and domestic animals.

5. That these particular diseases are most prevalent in swampy and undrained districts, and very often become epidemic.

But in addition to its pernicious influence upon human health, the presence of stagnant water is also highly injurious to the quality of land for agricultural purposes, as it prevents the entrance or penetration of the rain, and consequently also the necessary circulation of air beneath the surface. It is a well-known fact that the mechanical action of the rainfall is an important factor in agriculture, as through it the atmosphere gains an entrance into the soil and supplies the oxygen required by all plants. In wet ground, therefore, the oxidation of organic matter can progress very slowly; and instead of the soluble salts and harmless compounds which are the ultimate products of rapid decomposition, a series of unstable chemical combinations will be generated by the slow decay of such matter which are detrimental to the growth of marketable vegetables. When a plant dies upon a dry surface, only a comparatively short period of time will elapse before all traces of its original structure become obliterated, and its organic matter appears to have vanished into air; but if such a plant be immersed in stagnant water, and thus excluded from the action of the atmosphere, it will blacken and perhaps gradually crumble, yet in bulk it will long remain where it was originally deposited. Should other plants grow up, die, and fall upon the same spot, the process will be repeated, and the black muck or vegetable mould thus produced will accumulate from year to year, until it attains, often, a formidable depth.

The excessive moisture, furthermore, prevents the warming of the soil by the sun's rays and the heated atmosphere which is essential to the success of almost every profitable crop; and by evaporation, on the other hand, it abstracts warmth from both the soil and the air. Wet ground is therefore always cold, and the produce raised upon it is consequently late in ripening. Many varieties of weeds also flourish in such soil, so that reeds, rushes and mosses are frequently observed to crowd out completely the valuable grasses and garden plants which are objects of cultivation. As all of these unfavorable conditions prevail upon the Tonawanda swamps, it is obvious that systematic drainage alone will give to the land a commercial value and render it fit for useful production.

The physical characteristics of the two great drainage areas are substantially identical, and hence any particular descriptions will apply to

both. In the depressions, limestone rock of the Niagara group is generally found at a shallow depth, overlaid by a deposit of clay, while the surface soil is muck and marl. In Genesee and Orleans counties, this muck is black and very rich, and attains a depth of several feet; while in Niagara and Erie counties much clay and loam are mingled with the vegetable mould, thus making the surface ground more compact and impervious.

The rocky strata are nearly horizontal, having only a slight dip to the west and somewhat more to the south. Towards the west the strata also break off in a series of small steps or worn terraces, thereby giving the surface a general and gradual descent in that direction. In view of these peculiarities, the principal causes which induced the formation of these swamps are obviously, — first, the large extent of the drainage areas and the nearly level surface of the bottom of the basins; second, the impervious character of the substrata, by which the ready absorption of the rainfall is prevented; third, the appreciable dip of the rocky layers to the south, whereby the efficiency of any natural outfall in a northerly direction is greatly diminished; fourth, the lack of natural outfalls of suitable dimensions and declivity to both the west and the north, through which the surface drainage, as well as the water from the numerous permanent springs and brooks abounding in the locality, could promptly be removed; fifth, the existence of a series of natural and artificial obstructions in the original water courses, which both retard the discharge and occasion a rise in the level of the subsoil water; and sixth, the gradual elevation of the beds of the natural streams flowing into and through the swamps by accumulations of silt which cannot be scoured away in consequence of defective or obstructed outfalls. Through the action of these causes, accordingly, the drainage waters have been compelled to spread out over extensive low areas and become stagnant upon or near the surface of the soil, thus rendering it marshy and preventing its agricultural utilization.

The black muck, which is distributed over the whole of the Oak Orchard creek swamp, and also over many parts of the Tonawanda creek swamp, is evidently very fertile. In the former area it sustains, even in its present wet condition, a dense vegetation, consisting principally of large and flourishing elm, ash, oak, soft maple and cedar trees, together with a thick undergrowth of alder and other bushes, as well as an enormous quantity of aquatic plants; while in the western area, those portions of the land which have already been drained are famous for their large crops of grain and other farm produce. It must be remembered that muck of this character is usually rich in nitrogenized constituents as much as two per cent of nitrogen being frequently found by chemical analysis. This element is a principal constituent of manures and other fertilizing agents; and in such, its value can be rated at twenty-five cents per pound. A ton of muck, therefore, containing two per cent or forty pounds of nitrogen, would be worth ten dollars; and hence the prospective value of these lands can readily be estimated. The muck, however, requires thorough drainage and manipulation before its fertilizing properties can be made fully available; but notwithstanding the labor and expense thereby involved, it is sufficiently evident from the foregoing that a vast amount of wealth at present lies idle and neglected in the great bogs under consideration.

Previous to 1820, the swamps of the two great drainage basins were

practically continuous; but in that year the canal authorities of the State cut an artificial channel about four and three-fourths miles long in a northerly direction through the marsh from Tonawanda creek, in the town of Alabama, to a point where Oak Orchard creek issues from its swamp sources and flows thence with considerable declivity towards Medina. The purpose of this channel was to supply the Erie canal with water on the long level from Lockport to Rochester, and the creek was accordingly converted into a part of this feeder. But in constructing the artificial channel, a low embankment was formed along its course over the originally continuous marsh, and thus the latter was actually divided into the two areas defined above by preventing the flood waters of the eastern section from flowing westerly into the outfall afforded by Tonawanda creek. It is therefore evident that when the feeder was in full operation, a large volume of water was diverted from Tonawanda creek, conveyed across the swamp, and discharged into Oak Orchard creek, in consequence of which its defective character as an outfall for the eastern swamp was rendered worse by being charged with the delivery of a great additional quantity of water, so that the flood waters from its own proper drainage area were set back and their discharge considerably retarded. Extensive tracts which were formerly cultivated without particular annoyance from floods thus became overflowed in rainy seasons, and remained so for such length of time as to cause much loss and suffering. Relief at last became necessary, and the outfall was improved by a partial removal of the rocky bed of the creek at the northern margin of the swamp; but the benefit thus derived was rather limited in extent and the large Oak Orchard creek swamp still remains practically undrained. In this connection, however, it is proper to state that the canal authorities assert that the feeder and creek have been greatly improved, and that such improvement has more than compensated for the additional height produced in the water surface of the creek at the times when the head-gates of the feeder are opened at Tonawanda creek. To determine clearly whether the State has any further duty in the matter is not now the writer's province, as this would require the expenditure of much more time than has at present been granted.

The construction of the artificial channel across the marsh, however, was of service to the western section, as much flood-drainage was intercepted by it and carried into the northern outfall. Drainage in this portion was thus rendered easier, and the area in the course of time lost much of its swampy character. Great improvement in the district as a whole is nevertheless desirable, as the soil is still too moist to be regarded as guaranteeing immunity from malaria. In many places, also, large patches of marsh occur, which can not be drained by the existing ditches, and which consequently remain to breed the fevers affecting these localities. This difficulty is doubtless due to the fact that the plans for drainage were limited only to comparatively small areas, and were executed at various intervals by different parties, so that the want of a comprehensive system for the improvement of the entire territory included in this western section now becomes plainly apparent.

As for the Oak Orchard creek swamp, its course and position in the landscape can readily be traced by the gloomy forest which extends almost unbroken and impenetrable for miles in the directions already

indicated, and which serves at present only as an abiding place for loathsome reptiles and the far more dangerous germs of malarial disease. The removal of these poisonous emanations by well-considered and systematic drainage may therefore properly be presented as an urgent public necessity, particularly since no serious topographical difficulties prevent this area from soon being converted into one of the richest and most salubrious agricultural sections of the whole State.

Much attention has of late been directed to the sanitary improvement of large cities and towns, as the subject has become one of national importance. The best scientific and practical talent in the world has been induced to enter this service, and in all of the numerous published reports and descriptions of such work in cities, the greatest stress is laid upon the element of thorough drainage, in order to preserve the public health and thereby protect the great interests of commerce and manufacture, which constitute a nation's wealth.

Illustrations of the benefits to be derived from lowering the level of the sub-soil water are, however, not confined to cities alone. The reclamation of vast marshes and the drainage of extensive bogs and wide agricultural districts have uniformly been followed by such increase in value of land, and by such immediate disappearance of the malarial diseases which prevailed in former times, that the highest expectations of the promoters of these schemes have been fully realized. Numerous instances of this kind might easily be adduced from all parts of the world, but for the sake of brevity we will cite only a few of the more important cases which have been executed in England, Holland, France, Germany, Italy, and the United States.

The Fen districts of England, sometimes also called the Bedford level, were once a series of extensive marshes, stretching along the eastern coast for a distance of about 130 miles, and from five to thirty miles in width. Previous to the execution of the drainage, these lands had little or no value, and in the spring-time the occurrence of ague in every family of the population used to be the rule, so that the presence of these causes of poverty and disease became a grievous burden to the entire state. During the reign of Charles I. measures were taken to ameliorate the condition of these localities, and the work has steadily progressed until now almost the whole of the districts have been brought under successful and highly profitable cultivation, and have become rich in corn and cattle. Marked improvement in the sanitary condition also invariably followed the drainage of district after district, and very soon the ague had practically disappeared. It recurred, however, at intervals in the autumn instead of the spring, as formerly, but it was soon discovered that the drainage had been carried beyond the limits of prudence by permitting the ditches to become nearly, or quite dry throughout the hot summer months, whereby large exhaling surfaces were exposed to the air and heat, and a noxious effluvium was generated from the decaying organic matter. The recognition of this fact immediately suggested a simple and efficient remedy, which consisted merely of the introduction of water from convenient higher sources into the drainage ditches during the dry season, and by which the malady was again permanently banished.

In Holland and the Netherlands drainage is vitally necessary, as a large area of the richest agricultural territory of these countries lies

several feet below the level of the sea, from which it was reclaimed by the exertions of the Dutch engineers. The drainage of the Haarlem Meer, yet in progress, will eventually bring under cultivation about 45,230 acres of the most fertile soil, and thus add enormously to the general wealth of the state.

France has recently executed a highly important work in the drainage of the "Dombes," a large district north-easterly of Lyons, and which was formerly notorious for the unhealthiness of its climate. The surface formation consists principally of a mixture of flints, sand and gravel, cemented together with alumina, peroxide of iron and silex, into an impervious material, beneath which are found deposits of permeable gravel and loose rocks. Lying at a low level, a great part of this district was covered with marshes and small lakes or ponds, which prevented the agricultural utilization of the area and became vexatious sources of malaria. The improvement of this land was at length undertaken by the government, and since 1853 about 25,000 acres have been reclaimed and put under cultivation, railways and a system of roads have been constructed, and numerous wells have been sunk in order to obtain a sufficient supply of water suitable for drinking purposes. The cost of these works during the past twenty-five years has been about \$1,400,000; but the outlay has proved wise and profitable, since the increase of the direct and indirect taxes are more than sufficient to pay the annual interest. During this period, also, the population has increased thirty-three per cent, the average duration of human life has been raised from twenty-two and five-sixths years to thirty-eight years and the general character of the climate altered in a marked manner.

The results of the important drainage works which have been executed during the past twenty-five years, in various parts of Germany and Switzerland, also serve to prove that drainage for health is drainage for wealth. In the valley of the Unstrut, a small stream in Saxony, large swamps occurred, which generated fevers in the locality to an alarming extent. Upon a single large estate in this valley, one-third of all the people were continually afflicted with fevers, and in the neighboring village of Gehofen, which had about thirteen hundred inhabitants, the sanitary records show that from fifty to sixty cases at a time of malarial disease were frequently registered. Throughout the year following the completion of the drainage works not a single case of fever was reported, and the benefits of the improvement were also noticeably felt by domestic animals. At one place in this valley, the mortality among sheep was reduced from twenty-six and six-tenths per cent, to twelve and three-tenths per cent, and among cattle, from ten and five-tenths per cent, to eight per cent; and at Gehofen the statistics show a reduction in the death rate among sheep from fifteen and twenty-five one-hundredths per cent, to eleven and seventy-five one-hundredths per cent, and among cattle from five per cent to two and five-tenths per cent. Similar advantages resulted from the improvement of a portion of the valley of the Oder, north-east of Berlin. This district, which embraces many thousand acres, was likewise afflicted with extensive marshes, and was considered so unhealthy that only about one hundred and seventy families were dwelling upon it previous to the drainage. The reclamation of the land here again wrought a wonderful change in the climate and value of the soil, as within only a few years after its completion, the population of the district increased to twenty-four thousand.

In Italy, the subjects of land reclamation and the abatement of the pestilential vapors generated by a number of extensive swamps have attracted much attention. The Pontine marshes in the vicinity of Rome, the swamps in the Chiana valley near Florence, and the Maremma, a vast marshy region, embracing an area of nearly one thousand square miles, on the coast of Tuscany, were formerly fruitful and populous plains; but by long neglect of the natural water-courses of the districts, these rich low-lands gradually became converted into marshes and prolific sources of miasmata, prejudicial alike to man and beast, until at length the few surviving inhabitants were compelled to remove and leave the land to utter desolation. Various projects for the amelioration of these districts were undertaken with excellent results, notably in the Chiana valley, which has since become exuberantly fertile, forming a perfect garden, supporting at the present time a population of more than one hundred thousand.

The recently completed drainage of Lake Fucino, which a few years ago covered the greater part of certain high table lands about fifty-three miles east of Rome, affords another striking illustration of the significance and national importance of such works. This great improvement appears to have been conceived by Julius Cæsar, and was afterward partly effected by Claudius and Hadrian; but the ancient works were subsequently allowed to fall into decay, whereby the lake soon resumed its former extent and malignant character. The new project was completed by private enterprise in June, 1875, and the lake is now entirely drained, thus reclaiming thirty-five thousand acres of the finest arable land, and changing the face of a whole province by bringing health, industry and prosperity into a region where fever and pauperism had previously held undisputed sway.

In our own country the subject of systematic drainage has not as yet received the general and energetic attention which has been devoted to it elsewhere, on account of the abundance and cheapness of salubrious fertile lands, and the relatively small population per acre in agricultural districts. Extensive drainage works have therefore usually been executed only in the vicinity of large cities, and other populous localities, where the imperative necessity of preserving the health of a dense population, and of obtaining valuable land for the growth and sustenance of the community has been recognized.

Vast areas of unreclaimed swamp-land, however, exist along our coasts, and also upon the elevated plateaus and broad valleys of the interior. From their particularly advantageous location, and the inherent richness of their soil, many of these marshes are steadily increasing in prospective value for agricultural purposes, and have already attracted the notice of capitalists, as well as of sanitarians. The swamps in Westchester and Orange counties, in this State, afford excellent illustrations of this statement, and the successful drainage of a tract containing about five hundred acres of pestilential marsh near Goshen, in Orange county, will serve to demonstrate the benefits of systematic drainage from a sanitary as well as a financial standpoint. Twenty years ago the district in question was pronounced dangerously unhealthy in consequence of the malaria generated in the extensive swamps, and the value of the undrained land was then only about one dollar per acre. The artificial lowering of the subsoil water level, however, quickly dispelled the miasmata, and laid dry a soil composed of the finest black

muck, which subsequent cultivation proved to be of fabulous richness. As soon as this fact became apparent, the price of this reclaimed land speedily advanced, until now its average value is estimated at five hundred dollars per acre. This high price resulted from the extraordinary adaptability of the soil to the culture of onions, crops of eight hundred bushels per acre not being uncommon, and their quality becoming celebrated throughout the country. The success of these onion-meadows quickly led to the reclamation of similar lands in other parts of the neighborhood, so that in 1879 the onion crop of Orange county, was reckoned at five hundred thousand bushels. The soil is tilled with very little labor, and the average yield is estimated at three hundred bushels of onions per acre.

From the few examples of well designed drainage work just cited, a comprehensive view is afforded of some of the more important advantages and benefits which are derived both by individuals and society from the reclamation of marshes and wet lands. In every instance it will be found that such improvements are quickly followed by increased health and duration of life in the district, as well as by large pecuniary profits, which will amply repay the labor and capital expended in draining the soil. To illustrate how speedily the beneficial effects of removing stagnant water are felt, we may further adduce the case of the recent drainage of the bed of the lately abandoned Chemung canal, between the towns of Horseheads and Havana, in this State. Upon the removal of the water from the canal, the latter became the receptacle of a large amount of intercepted surface-drainage, which had no opportunity to escape from the artificial channel, and accordingly became stagnant therein. The result was that malarial diseases soon became very prevalent along the route of the canal, and the subject was finally brought to the notice of the State Board of Health, who thereupon instituted proceedings to insure the discharge of any drainage which might find its way into the abandoned channel. The work thus rendered necessary was performed last July, under the supervision of your Board, and already in September the sickness had almost entirely ceased along a course of nine miles, where nearly all had been suffering from miasmatic fevers.

In regard to the practicability of draining effectually the two basins of the Tonawanda swamp territory, and of rendering them more healthy, it will be sufficient merely to refer to the topography of this entire district, and to give a few data of relative elevations in order to dispel any doubt of its successful and economical accomplishment. As has already been stated, the general surface of the flat lands, in both basins, slopes towards the west at a nearly uniform rate of one and one-half feet per mile. In a stream of moderate size, a descent of this magnitude would create a strong current, and it is also amply sufficient for the prompt removal of water in all properly designed main-drainage ditches. The western basin, therefore, if permanently relieved from the floods of the eastern district, can easily be improved, and the marshes therein converted in fertile gardens. Systematic and general action throughout the whole area, however, is imperatively necessary in order to secure beneficial and lasting results. The work already performed can be utilized and enlarged wherever required; and thus the value of the land and the health of the inhabitants might be greatly increased at comparatively small expense.

The eastern basin, on the other hand, is susceptible of being thoroughly drained into the outfall presented by Oak Orchard creek, as will be seen from the following data. From the head of the swamp to the feeder the general surface of the ground falls at the rate of one and one-half feet per mile; and the junction of the artificial channel with said creek at the northern margin of the marsh is about one hundred and one feet above the water surface of the Erie canal at Medina, the distance between these points being nearly seven miles. Although this rapid descent is not uniform, on account of numerous small cascades, yet by deepening the bed of Oak Orchard creek for two or three miles northerly from the swamp, a fall of ten feet can be obtained, which would afford an excellent outfall for the drainage of the twenty-five thousand acres of marsh in the counties of Orleans and Genesee, and perhaps also for the waters from a considerable area on the western side of the feeder. It is therefore evident that with such topographical opportunities, no serious difficulty can be said to stand in the way of the reclamation of the entire eastern district; and it seems almost incomprehensible that in the heart of a region, so famous for its beauty, fertility and high agricultural improvement, this large tract of waste land, which is so easy of access and cultivation, has not long since been changed from a colossal nuisance into a source of enduring wealth.

The problem of the sanitary drainage of these two large basins in all its details is, however, by no means simple, and will require a vast amount of careful study and elaboration before a solution can be submitted which will meet all the conditions that circumstances now impose. The State has important interests in the conservancy of the waters of both districts for the supply of the Erie canal; and individuals have privileges which must be respected, since these waters are sources of power for various industrial pursuits; but each must take cognizance of the great sanitary and economic interests which are essential to the prosperity of the great commonwealth.

A proper plan for the improvement of these two vast swamp areas must accordingly take all of these varied interests into account, and must also furnish devices for preventing the destruction of the reclaimed peaty soil by fire, as well as provisions for maintaining in it the degree of moisture required for profitable cultivation. New roads, moreover, are needed to develop the reclaimed territory by affording ready means of access and communication; and care should be taken in their construction to prevent them from becoming serious obstacles to the natural flow of the surface and subsoil waters.

As time rolls on, new interests are liable to arise from the exigencies of communities, corporations and individuals, which will only complicate the problem and tend to a postponement of the work of drainage. It has already been stated that numerous detached areas in the swampy districts have been rendered fit for cultivation, perhaps, but have not been improved sufficiently to warrant their being pronounced healthy. Experience in other localities also demonstrates that the principal aim of such works, which have been executed by private enterprise, is to adapt the marshy land for agriculture with the least possible expense and to leave the more important sanitary considerations wholly out of sight. In all such cases of unsystematic or disconnected drainage, the results have proved unsatisfactory, and great difficulty is generally en-

countered in persuading the owners to incur further outlay by improving the means for lowering the level of the subsoil water. It is therefore apparent that the drainage of large swampy areas should in the very outset be treated upon comprehensive plans in order to secure and maintain outfalls capable of removing the surplus water in proper time; and that a strict adherence to the system of ditches and drains co-ordinated with the outfalls is absolutely necessary to insure general welfare and to give health and wealth to the entire district.

Sanitary considerations, furthermore, demand that the drainage of the marshy territory under discussion should be effected before the forests, which still cover the greater portion of the Oak Orchard creek swamp, and many smaller areas in the western basin, are hewn down and supplanted by a rank growth of essentially aquatic vegetation. The demand for timber is constantly increasing, and a time will soon arrive when it will become profitable to remove the trees in this locality, despite the attendant difficulties. A large amount of decaying organic matter will then be exposed directly to the burning rays of a summer sun, and the evolution of malaria or poisonous gases will be correspondingly augmented. In the shade and quiet of the forests, on the other hand, decomposition takes place more slowly, and the wind, not having opportunity to sweep unrestricted through the marshy region, will therefore not spread the noxious exhalations so readily over a wide extent of country. Large trees, moreover, will absorb any surplus moisture that may be left in the ground after the completion of the primary drainage works much more rapidly than the mosses, rushes and swamp grasses which quickly spring up after the denudation of the surface.

The undrained lands have now little or no value, but when they have once been improved by systematic drainage and intelligent cultivation, there can be no doubt that their value will become as great, and perhaps even greater, than that of the adjacent dry lands, which at present ranges from \$50 to \$100 per acre. The wealth thus accruing to both individuals and the State from the reclamation of these waste lands can therefore readily be computed. An increase in the population of the districts would also follow the drainage of the soil; and if the low rate of one person to every ten acres of land be assumed for the calculation, it will be safe to conclude that at least 5,000 industrious inhabitants can gain a livelihood from agriculture upon the 50,000 acres which are now covered by swamp and imperfectly drained land. The general health of the whole locality would likewise be greatly improved; and, as in other countries, broad fields and rich meadows would soon be found in the present fever infested areas.

In the foregoing, it has been the writer's aim to give a fair description of the large tracts of marshy land in western New York which have long been known as the Tonawanda swamps, and to point out the principal physical characteristics in consequence of which the eastern area of low land has remained a desolate marsh, while the western basin has been considerably improved. Brief reference has also been made to the evil effect of swamps upon the prosperity and health of the inhabitants, and this has been illustrated more definitely by the citation of a number of instances of successful drainage, wherein the varied benefits resulting from such works have been made manifest. The practicability of reclaiming the swamps in question has likewise received some attention, and the principal elements which would have to be taken into account

in any scheme for the systematic improvement of the territory have been indicated. Many more details could easily have been added, but only at the cost of conciseness and the broader view of the subject which is required in the preliminary work. Prominence has been given to the motto that "drainage for health is drainage for wealth," and to the assertion that by a well-devised and carefully executed system of outlets, extensive districts like the Tonawanda swamps can be reclaimed and made highly profitable to both the land owners and the State.

In the creation of wealth, however, man and nature must operate together, for it is only when made available by the agency of human intellect and power that the contributions of nature can attain a value. But sound physical health is the real basis of such human power, and hence the protection and enlargement of this power by zealous watchfulness over human health should be the chief responsibility of every government.

In conclusion, permit me to acknowledge the receipt of much and invaluable assistance in the preparation of this report, from Dr. Elisha Harris, Secretary of your Board, and also from Hon. J. W. Holmes, of Genesee county, both of whom have for many years devoted much time and study to the great problem of converting these malarial districts into magnificent and salubrious gardens. It was also my desire to accompany this paper with a reduced copy of an excellent map of the Oak Orchard creek swamps, which was carefully prepared by Hon. Mr. Holmes, and kindly loaned to me for the purpose, but lack of time has prevented me from carrying out that design.

Respectfully submitted,

EMIL KUICHLING, *Civil Engineer.*

REPORT.

TO THE STATE BOARD OF HEALTH, ON THE METHODS OF SEWERAGE
FOR CITIES AND LARGE VILLAGES, IN THE STATE OF NEW YORK.

By JAMES T. GARDINER,

Director of the New York State Survey, Chairman of Committee on Drainage, Sewerage
and Topography.

The advice of this Board has been so often asked by cities and villages of the State in reference to the proper disposal of their sewage; and the complaints are so numerous of disease and death attendant upon the present ways of treating this matter in most towns; that it has become necessary to determine whether among the many means in use there is any plan of taking away the sewage of towns healthfully, efficiently and cheaply. I say *of taking away*, because the custom of storing up the filth of towns in privy-vaults and cess-pools, to poison the earth and contaminate the water and air, is one against which all the influence of this Board should be exerted.

The awful lessons taught by epidemic disease are awakening the towns of the State to the need of relief from the prevailing privy-vault and cess-pool nuisances.

What shall be done with the sewage of these many populous towns of New York; how can it be best removed from the dwellings, is the question I have endeavored to answer since the resolution of the Board instructing me to examine, during my recent journey, the results of European experience in sewerage.

I find in general that wherever intelligent efforts have been made to produce proper sanitary conditions for towns, cess-pools and vaults are abolished; and the sewage is *removed* from the neighborhood of the dwellings by "dry removal," or by "water carriage," which is sewerage.

DRY REMOVAL.

The two common methods of "dry removal" are by the use of the dry earth closet, and the cask, or "pail" system.

In the former the urine and fæces fall into a receptacle, and dry powdered earth is added after every evacuation. This dry earth,

when of the proper kind, both deodorizes and decomposes the *feces* so that they disappear. The compost is removed at *infrequent* intervals and used as manure. The success of this method depends on a proper supply of loam, or clay, dried and powdered, the prompt covering of the *feces* after every evacuation, on the removal of the compost and thorough cleansing of the receptacle, and in ventilation of the closet. Without the fulfillment of all these conditions the earth closet soon becomes a nuisance.

In practice it is found that the provision of proper earth, and the constant intelligent surveillance necessary cannot be secured from any but exceptional families. The system of dry earth removal cannot therefore be safely recommended for towns in which so large a proportion of the people are always ignorant and careless.

THE TUB OR PAIL SYSTEM.

The tub, cask or "pail system," used even on a large scale in England, France and Germany, is undoubtedly the best method of removal where towns have neither water supply nor sewerage.

In this system the excreta are allowed to fall into a tub or cask, in England called a "pail," which is removed, emptied, and thoroughly cleaned by the town authorities at least once a week, some disinfectant being placed in the tub after cleaning. In Manchester, England, sifted ashes are added during use to the contents of the tub as a deodorizer.

The simplest form of this method of removal, and the one most applicable to the villages in the State of New York, is that employed in Rochdale, and in Manchester, England.

Rochdale is a city of some 70,000, and Manchester of between 400,000 and 500,000 inhabitants. The higher class of houses are allowed to have water-closets, but four-fifths of the people are obliged to have "pail closets" in their yards built according to plans of the Health Department. Their essential features are: A flag-stone floor raised a few inches above the level of the yard; a hinged seat with a metal rim underneath for directing urine into the pail, which stands on the flag directly beneath the seat; a hinged front and back to the seat so that the pail or tub may be easily taken out and the place cleaned; and a six-inch ventilating pipe from under the seat to above the roof. In Rochdale they use a wooden pail or tub made of half of a disused paraffine cask holding about 100 pounds; in Manchester the "pail" is of galvanized iron and holds ten gallons. Under the direction of the authorities they are removed once a week in covered vans, which bring clean tubs to be put in the place of the full ones taken away. Each tub is covered with a close fitting double lid before removal. The tubs are taken to a depot, where their contents

are deodorized and prepared as manure by mixing with ashes and a small proportion of gypsum to fix the ammonia. Subsequently street sweepings and the refuse of slaughter-houses are added. At Manchester there is by the side of each closet a very simple ash sifter, from which the ashes fall into the tub and help to deodorize its contents.

The manure at Rochdale sells for about four-fifths of the cost of its collection and preparation.

In 1873 the net cost to the town of removing and disposing of the house dry refuse and excrement was only about \$95 per annum per 1,000 of population; less than ten cents a person per annum.

The system has been in operation more than twelve years.

The tubs are removed in the day time without offensive odor.

Where ashes are frequently thrown into the tubs at Manchester very little odor is to be perceived in the closets.

For the villages of the State which can have no general water supply, I would unhesitatingly advise the use of the "pail" or tub system as practiced in Manchester, England, as being, from a sanitary point of view, an immense improvement over the death-breeding *privy-vaults* in common use. The cheapness of the plan and the smallness of the original outlay of brains and money, in comparison with that needed to build a good sewer system, will make it possible to introduce a tub-privy system into most villages half a century before sewers would meet with any consideration.

At a small cost the existing *privy-vaults* can be cleaned and filled, and the privies altered into healthful tub-closets. The town authorities must then arrange for the removal of the tubs once a week, and for their thorough cleansing and disinfecting. Any isolated house or group of houses can use the tub system, taking care of it themselves. If the plan is adopted in villages, it will doubtless spread into the country, and become the most powerful means of abolishing the fatal *privy-vaults* which are poisoning the farm wells.

Believing as I do that *privy-vaults* are such an active and widespread means for breeding disease and bringing needless sorrow and death into hundreds of houses; and being convinced that in this country, as in Europe, the tub system will be found the most immediately practicable, efficient remedy, I recommend to this Board to take measures to secure its adoption in villages and towns where sewers are not likely to be built.

The weakness of the "tub system," as it should be called in this country, is, that the removal, cleansing and disinfecting of the tubs requires constant care and is a standing expense. Careless, ignorant, or parsimonious village authorities may, by neglect or from false economy, fail to provide for the removal and proper cleahing of the tubs

at sufficiently frequent intervals ; but under no circumstances would the evils of this neglect be comparable with those of privy-vaults. The small size of the tubs puts a narrow limit to the interval between removals, and compels attention.

While this system is immeasurably more healthful than privy-vaults, it is unavoidably inferior to that of sewerage, in that it does not provide for the removal of waste-water and slops. In Rochdale and Manchester they have been obliged to build sewers and drains for slops, waste-water and storm-water.

"WATER-CARRIAGE" OR SEWERAGE.

Large villages and towns, where population is so dense as to render the use of wells dangerous, require an abundant supply of pure water distributed through the town in pipes. Means must be provided for the removal of this water after it has been used. Towns with water supply, therefore, find themselves called upon to provide for the removal of excreta, waste-water slops, and storm-water. In Manchester, Rochdale, and other English cities and towns, in Paris and other continental cities, the experiment has been tried of carrying off the human excreta in tubs, while waste-water slops and storm-water are led away in sewers. But the inconvenience, expense, and rigid supervision necessary in the tub system, as applied to large towns, has induced most of the larger cities both in Europe and America to provide for carrying away human excreta with waste-water from the dwellings by drains into the sewers, which already existed for the purposes of draining off more or less of the storm-waters falling on streets and yards. Sewers for disposing of surplus storm-water being necessary in many places, and being already in existence when general water supplies were introduced, it seemed most economical to extend them, and to drain into them both waste-water and human excreta in addition to the storm-water, for which alone they were originally intended. This was the origin of the "combined system" of sewerage, in which the sewers are arranged to carry off excreta, waste-water slops, and storm-water. The large size of these sewers is made necessary by the admission of storm-water.

The great expense of the "combined system" of sewerage, the difficulty of keeping the large sewers clean, and the increasing difficulty of disposing of quantities of diluted sewage have led to the further experiment of building a system of small sewers to carry away only waste-water and human excreta, which are properly sewage ; and disposing of storm-water by surface gutters and short sewers leading to the nearest natural water-courses. This is known as the "separate system" of sewerage.

The combined system of sewerage.—This system of sewerage can only be economically used where it is necessary to provide, even at large expense, for carrying off the storm-water underground. The storm-water falling per hour in violent rains over an acre of closely built up city land is nearly fifty times the amount of the waste-water and sewage produced per hour on the same area. The sewage is, therefore, ordinarily a mere trickling thread in the bottom of a sewer large enough to carry off great bodies of storm-water. In time of rain the sewer will be nearly or quite full of dilute sewage, which is absorbed by the bricks, and leaves a coating on them as the water falls. The powerfully flowing stream of storm-water on subsiding deposits silt in the bottom of the sewer which obstructs the flow of sewage, giving it time to decompose. Foul gases are then emitted, and it has been popularly assumed that these gases, called "sewer gas," are the cause of disease.

Physicians are agreed upon the fact that air from sewers passing into a dwelling is very likely to produce serious disease. That this illness is due to a *gas* from decomposing sewage is a mere assumption unsupported by proof. But the hypothesis was hastily adopted by engineers; who naturally inferred that the healthfulness of large sewers would be secured if they could only drive out or sufficiently dilute this gas by ventilating the sewer, or prevent its formation by keeping the stream of sewage flowing uninterruptedly. The discussion of the subject by Mr. Elliot Clarke, in the Massachusetts Board of Health report,* and the opinion of other engineers who favor large sewers, seem to be based on this idea.

It is time, therefore, to call attention to the fact that *no such gas as "sewer-gas" exists*, and that *there is absolutely no proof that the diseases which attend the admission of sewer-air into a dwelling are produced by gases*. On the contrary the whole tendency of modern investigation is to show that the zymotic diseases are produced by *bacteria*,† whose germs are developed under favorable conditions. It is well known that the most favorable conditions for the growth of these low organisms are heat, moisture, darkness and the *presence of ammonia*. The damp walls of sewers present, therefore, all the requirements for a most flourishing growth of bacteria, whose germs may float off on the sewer-air and be carried into dwellings by mechanical action, as dust is borne on any air current.

It is, therefore, most probable that sewer-air brings the germs of disease into dwellings as dust is blown into the window. The foul gases of decomposition may or may not be present. The fatal power over

*Second Report Mass. State Board, New Series, 1880.

†The Medical Members of the State Board do not admit or deny that there is such a tendency. It is the author's privilege thus to express his belief. E. H., Secretary.

life lies, probably, in the little plant-seed, odorless and invisible, floating upon the sewer-air.

Large sewers are, then, plantations for the propagation of deadly organisms, the moist, porous walls forming most favorable soil, the ammonia of sewage supplying the manure essential to full development, and the warm, damp air stimulating to the utmost all processes of growth.

The occasional flushing of sewers, while it may clear out silt and accumulated filth, and thus decrease the amount of heat and ammonia from decomposition, can never prevent the growth of bacteria on the sewer walls, nor will ventilation prove efficient. Every device of engineering has been exhausted to keep large sewers clean and well ventilated, but the air from them is still deadly. Experience, therefore, teaches that there is some radical defect in the system of large or combined sewers, while modern investigations of the origin of zymotic diseases and the mode of growth of bacteria seem to show that sewer walls are almost ideal hot-beds for the production of fatal organic germs. Perfect plumbing may prevent sewer-air from entering dwellings, but perfect plumbing will always be the rare exception.

In view of these facts I am forced to conclude that from a sanitary point of view the combined system of sewerage is a failure.

I visited in London the sanitary department of the Local Government Board which has general supervision of the sanitary affairs of England. The Chief Engineer, Mr. Robert Rawlinson, C. E., and the principal medical inspectors, Dr. Ballard and Mr. Radcliffe, are perfectly agreed that the combined system of sewers is radically defective from a sanitary point of view. In this opinion Dr. Richardson and other prominent sanitarians concurred. At the meeting of the British Association for the Advancement of Science, in York, the leading civil engineers whom I met had abandoned their belief in the "combined system" of sewers, being convinced that it could not be made healthful.

While all were agreed as to the failure of the "combined system," some of the medical men favor the general introduction of the "pail system" of Manchester of "dry removal" of the excreta in tubs, and the use of sewers entirely disconnected from dwellings, to carry off only waste and storm-water; while Mr. Rawlinson and other engineers advocated water carriage by the "separate system."

SEPARATE SYSTEM OF SEWERAGE.

This system provides for carrying off waste-water slops, and excreta by drains and sewers into which storm-water is not admitted. Since the sewerage to be taken from thickly inhabited areas is only about

one-fiftieth of the rain-fall to be provided for, it follows that sewers to carry sewage only may be very much smaller than those of the combined system. In fact these sewers consist mostly of six, eight, and fifteen-inch glazed pipe. They may run nearly full for a large part of the day. The main fifteen-inch sewer of Memphis runs three-fourths full at 11 A. M. The sewers being so small and so well filled by the flow of sewage, there is very little exposed wall surface on which bacteria can germinate, and very little space for storing up germ-laden air. The gases and heat of decomposition, which so powerfully stimulate the growth of organic life, are prevented by thorough daily flushing, which is only possible in small sewers. The smooth glazed surface of pipes is unfavorable soil for vegetable growth, compared with porous bricks moistened with sewage.

It will therefore be seen that the separate sewers do not afford those favorable conditions for an extensive and rapid growth of bacteria, *which are the fatal defects of the large combined sewers*. The smaller pipes move rapidly all sewage from dwellings, without connecting them with foul caverns *whose sides produce low organic life*. Where the separate system, with flush tanks, is in operation I can learn of no complaints of "sewer gas."

The "separate system" is therefore greatly to be preferred for sanitary reasons.

It remains then to consider whether there are engineering or economic difficulties which should prevent its adoption.

The principal engineering objection to the separate system was that small pipes would be liable to constant obstruction, either from large sticks or other bodies getting into them, or from accumulations of grease. It was also objected that they would not drain the cellars, and that the automatic flush tanks would get out of order.

In practice these difficulties have either proved imaginary or have been overcome. Grease does not enter sewers as grease, but is deposited in the house drain, within a few feet of the kitchen sink.

Obstructions from foreign substances have been so rare, and so easily removed, that they prove of little practical importance, the reason being that most bodies which are small enough to pass through traps and four-inch house drains will not probably stop in six-inch sewers. In Memphis, a city of 35,000 people, thirteen cases of stoppage in the six-inch pipe occurred in the first year of use, but no instance of stoppage in eight-inch pipes. The drainage of cellars and subsoil has been most effectively accomplished in Memphis by laying a system of ordinary agricultural drain tile in the same trench with the sewer; and the Field flush tanks have been found to work well even at low temperatures, and to effectually flush the sewers every day.

There are in fact no engineering difficulties with the separate system that have not been easily overcome.

In discussing the economy of the separate system it will be necessary to consider its application to three classes of towns :

First, towns in which the rain-fall is easily led off on the surface to natural channels of outflow, no system of sewers for storm-water being needed. This class doubtless comprises the great body of towns in the State of New York. For these places a system of *small sewers will cost from one-fifth to one-third the sum required to build a combined system*. The estimates for a combined system in Memphis were from \$800,000 to \$2,225,000 ; the actual cost of the separate system was \$187,000.

The second class includes those towns which require short storm-water sewers to lead the rain-fall to natural channels of outflow. The building of a comparatively small amount of large storm-water sewer, in addition to the separate sewerage sewers, will not generally make the total expenses equal to that of a combined system. In many places detached sewers already exist for the purpose of freeing certain parts of the town from storm-water, which serve this purpose well, while they are utterly bad for conducting sewage. For such towns the separate system of sewers will be most economical.

The third class comprises a few large cities where an entire system of storm-water sewers are needed in addition to a small system for carrying sewage only.

When the whole drainage is designed and executed from the beginning on this plan, the expense of a complete double system will be probably twenty-five per cent greater than that of the combined system ; but the cities where this will be required are generally able and willing to secure healthful arrangements at a small additional cost.

Those cities which have already spent large sums in completing combined sewers must either continue to suffer from the evils of sewer poison, or incur the further expense of a separate small system for carrying sewage only, retaining the large sewers for storm-water.

Hence it appears that for the great majority of towns, which easily get rid of storm-water in gutters, short drains and natural channels, *the cost of the separate system of sewerage will be less than half that of the combined system*.

Although a number of English towns have wholly or partially adopted a separate system, and the results have been so good that the engineers of the Local Government Board advise its general use, yet I was informed by the Chief Engineering Inspector, Mr. Rawlinson, that nowhere in England had the separate system been so completely developed and applied as in America, in the city of Memphis. He

assured me that English engineers and sanitarians were watching with great interest the working of the Memphis sewerage, considering its results to be a thorough test of the principles involved.

On further investigation of the small sewerage plans of Oxford and Dover, which I visited, and other English towns where modifications of the separate system are in use, I was confirmed in the opinion that the separate system of Memphis, designed by Col. George E. Waring, Jr., is much the most thorough and complete which has yet been built on a large scale. Instead, therefore, of describing imperfect English examples of the system, which, although great improvements over the combined sewers, are inferior to the American plan, I shall give the results of a recent examination of the Memphis sewerage, made for the city of Baltimore by Mr. C. H. Latrobe, C. E., a copy of whose report to the mayor and city council I have just received. I regret that I can only quote a very small part of his excellent paper. He says:—

“Having recently examined personally the Memphis system, I give below a description of the same: As is known to your Honors, the city of Memphis is situated immediately on the Mississippi river, and contains a population of 35,000. The fatal epidemics of 1878 and 1879 made it necessary to take decided measures for draining and sewerage the city, and abolishing the 7,000 cess-pools which had contaminated and poisoned the soil. In 1868 Mr. Charles Hermany made an exhaustive estimate of the cost of sewerage Memphis with the combined single system, and presented several plans, varying in cost from \$300,000 to over \$2,225,000, depending upon the amount of storm-water to be accommodated. As the excessive cost of these plans, in the impoverished condition of the city, effectually prevented their adoption in 1879, something more economical had to be devised. In this crisis Col. Waring was consulted, and advised the adoption of the separate system for the disposal of the house sewerage alone, through impermeable pipes, common tile drains to be laid in the same trench for the drainage of the sub-soil, and the storm-water to be permitted to flow on the surface into the nearest water-course. After considerable opposition this plan was adopted, and on the 21st of January, 1880, the work was actually begun. The system is based upon a flow of about forty gallons of sewerage per head per diem. The main outlet sewer is twenty inches in diameter, and built of brick; all the other sewers of burnt and glazed clay pipe, ranging from fifteen inches to six inches in diameter, the latter being the size adopted for nearly all branch sewers. At the dead end of every branch sewer is placed an automatic flushing tank with a capacity of 112 gallons. Each tank is filled from the city water supply through a pipe and spigot so arranged as to flow continuously with a sufficient stream

to fill this tank in twenty-four hours, or oftener if desired. As soon as this tank is filled to the proper height, a syphon comes into play, the tank is rapidly emptied into the head of the sewer, and thus prepares itself for another charge of water. There are, at this date, over twenty miles of sewer and one hundred and twenty-five flush tanks at work in Memphis, the total cost of which, including expenditures of all kinds, has been about \$137,000, or \$685 per mile. The system is now being extended so as to take in the entire area of the city. Of the 7,000 cess-pools, 5,000 have at this date been emptied and filled with clay, whilst the others are being filled as rapidly as possible. In my examination of the Memphis sewerage, I was accompanied by Major Humphreys, the engineer in charge, who is thoroughly acquainted with every part of the work. I first examined the flush tanks placed at the extreme ends of the branch lines. They fill and discharge with the most perfect regularity; there are literally no moving parts, and their extreme simplicity is manifest. They consist of a brick chamber built on a concrete bottom of any size designed (those in Memphis being forty inches in diameter), set below the level of the street, and covered like an ordinary man-hole with a perforated cover; in their center stands an annular syphon four inches in diameter. A three-quarter inch pipe near the top admits the city water, the flow being governed by a spigot. When the tank is filled to the top of the syphon the discharge takes place with a rush, the entire body of water (one hundred and twelve gallons) being discharged in from forty to fifty seconds. It first runs into a box under the syphon, and from thence into the sewer-head. As soon as the tank is emptied by the main syphon, its lower end is unsealed by a small subsidiary syphon, and the process of refilling the tank begins. The only drawback to the perfect action of these tanks has arisen from the muddy character of the city water, which may be appreciated from the fact that a half-gallon pitcher will deposit during the night one-half inch of solid mud. This muddy deposit sometimes clogs the action of the subsidiary syphon, which has a bore of only one inch. This difficulty has been obviated at Memphis by washing out the small syphon say once a week, with a small hose about three feet long put on the supply pipe of the tank—a process which takes about ten minutes. One man attends to and keeps in order the entire lot of flush tanks, one hundred and forty-five in number, without difficulty. The grade of the branch sewers, which are connected directly with the flush tanks, varies from six inches to three inches in the hundred feet; and the rush of water from the tanks is distinctly felt at a distance varying from four hundred to nine hundred feet, keeping the pipes perfectly clean. No tendency to freeze has been noticed in the tanks, although

the temperature has been as low as four degrees the past winter. These tanks are a patented article, and the city of Memphis paid ten dollars per tank for the privilege of building and using them. The total cost of a tank ready for use is forty-five dollars, exclusive of royalty. I should say from observation that these tanks fulfill admirably their purpose, are thoroughly automatic in their action, and require very little attention. Whenever it is practicable, the branch sewers of Memphis are located on alleys in the rear of the houses, so as to avoid the cutting of trenches in the streets. With the small sewers of the separate system this is perfectly practicable, and prevents the necessity of carrying the house soil-pipe to the front of the house.

"I next gave a close inspection to the condition of the main and outlet sewers, both to the fifteen-inch pipe and twenty-inch brick sewer. This was readily done, as it had been found expedient to break into the crown of the main at several points for the purpose of constructing man-holes. At the time of my inspection (11 A. M.), the sewers were running three-fourths full with a swift current. Nothing solid of any sort was to be detected in the flow, even by dredging; an occasional piece of paper constituting the only undissolved matter; every thing was in solution, and the sewerage was about the color and consistence of the Mississippi river water. Although in several places the entire crown of the sewer had been removed, it was difficult to detect any odor until you were within two or three feet of the flow. Major Humphreys stated this was the uniform condition of the mains, and that the ventilation seemed perfect. I would state in this connection that the main house-pipe is required by law to be four inches in diameter, and to connect with the sewer without a trap, its upper end is then carried above the roof of the house, full size, and left open; every water-closet, kitchen-sink, bath-tub and waste-sink connects with this four-inch pipe by a trap connection of its own. The varying height of the four-inch house-mains, together with the constant flow of sewage, stimulated by the intermittent discharge of the flush tanks, keeps the whole system well ventilated and in perfect order. The main and outlet sewers have an inclination of from one in four hundred to one in six hundred feet, and the sewage is finally discharged into Wolf river, near its confluence with the Mississippi. To assist the ventilation and afford means for inspection, it was originally intended to place a fresh-air inlet at every junction of a lateral sewer with the main; this is so arranged as to let in air and keep out dirt, and is covered with a grating. I found that out of forty provided, only nine had been used from this belief that they were unnecessary. The only deposit which has ever been noticed in the mains is a fine silt of moderate tenacity, supposed to be a mixture of the mud

held in solution by the river water, combined with the pulp of dissolved paper. This readily washed out by passing the ball through the mains from man-hole to man-hole. A hollow ball of galvanized iron having an inlet and stopper, and about three inches less in diameter than the sewer is charged with water sufficiently to keep it in contact with the roof, along which it rolls; it is then dropped into the sewer at a man-hole, the current instantly gorges, and rushes under the ball with great velocity, and scours the bottom of the sewer, the ball in the meantime rolls along the roof of the sewer, and is stopped, if desired, at the next man-hole, and taken out. Balls of different sizes are used as desirable. The above-mentioned deposit or silt in the mains has never been more than from one inch to one and a half inches in depth. The only obstructions which have occurred (thirteen in number) in the branch pipes during the twelve months in which the system has been in use have invariably been occasioned by sticks about six inches long getting across the pipe. The obstruction is immediately located by the rising of the sewage in the yard waste-sink of the house just above it. The sewer is then uncovered at the proper place, cut open on top, and the obstruction pulled out with a hook of twisted telegraph wire. This would seem to indicate that any slender article, not over six inches long, will pass through a four-inch trap; this is further proved by the fact that a number of two-foot carpenters' rules, which fold to six inches, have been taken out of the sewers. This being so, the remedy would seem to be either to use no pipe less than seven (7) inches in diameter, or to arrange the traps so as not to pass six-inch sticks. No obstruction has ever taken place in the eight-inch or ten-inch pipes, or in the twelve-inch, fifteen-inch or twenty-inch mains.

I understand, from Major Humphries, that not a single case has occurred of the breaking of the pipe. The drainage of the sub-soil by common agricultural drain pipes, from one to three inches in diameter, is excellent. They are laid along side of the sewer pipe in the same trench, and at the proper points are carried off to empty into the nearest water-course. Now, as to the house arrangements, the regulations are stringent, no plumbing is allowed on any plan but that adopted by the authorities and carried out under a rigid inspection by the engineer, and no house is permitted to connect with the sewer until inspected and passed. Every outlet for waste is connected with the four-inch house pipe and trapped; a slop waste is insisted on for each house, so that nothing is thrown into the gutter or on the soil. No pan closets or Brahma closets are allowed where there is an air space between the trap and the pan; the use of some form of hopper closet is preferred. All connections with sewers are made by **Y's** and not by **T's**.

"The city lays a branch every twenty-four (24) feet to the curb; to this the householder joins his iron four-inch house pipe. This avoids tearing up the street to make house connections.

"There has been to this date no complaint, in so far as I could find out, of sewer gas, and I cannot see how there could well be with so constant and rapid a flow of sewage, thoroughly dissolved, as was plainly visible in the mains. I learned from a prominent citizen and householder that the only inconvenience he had ever experienced arose from the breaking down, temporarily, of the water-works, which are on the Holly system, and which at the time depended on a single engine; for a few days he could not use his closets for want of water.

"By gaugings taken at the head of the twenty-inch mains I found the hourly flow of sewage to be remarkably uniform. Thus, from 6 A. M. till 1 A. M. the following morning, a period of twenty hours, the flow oscillated in centre depth from twelve and one-half to fourteen and one-half inches, the minimum area of flow being 206.5 square inches; the maximum, 245.73 square inches. From 1 A. M. until 5 A. M., a period of four hours, the center depth of flow varied from eight and one-half inches to eleven and one-half inches; minimum area being 107.6 square inches; maximum area, 186.9 square inches. Taking the twenty-four hours, the minimum flow is 43.7 per cent of the maximum; taking the twenty hours of greatest flow, the minimum is eighty-four per cent of the maximum, and eight-ninths of the daily flow of sewage passed in twenty hours, one-ninth in four hours. This marked uniformity of flow during twenty hours of the day, and its oscillating character within such small limits must be somewhat influenced by the action of the flush-tanks, which probably discharge in small groups.

"The force employed in maintaining the sewers alone and its cost I could not obtain accurately, as they were doing much other work with the same men; but, approximately, a force of four men watch and keep in order the entire system, including the flushing tanks, house visitations, etc. All the work at Memphis has been admirably and faithfully done under the immediate supervision of skilled engineer assistants.

"In summing up my impressions as to the separate system as developed at Memphis, I would say that it is well planned and well executed, and fully answers the purpose for which it was intended and which I conceive to be primarily the object of all sewerage, viz.: to carry off all human and industrial waste with rapidity and cleanliness to its ultimate destination.

"The accompanying system of tile drains has also thoroughly drained (as far as I know) the very tenacious sub-soil of the city. As to the

storm-water at Memphis, it can safely be left, from all I learn, to take care of itself.

"The errors or omissions in the Memphis system are :

"*First.* Insufficient size in the mains to accommodate the excessive use or waste of water during severe winters, when people allow spigots to run all the time, to prevent freezing. During the winter just ended, Major Humphreys estimates that one hundred gallons *per capita* per day were often used which caused the mains to run full bore, and occasioned a backing up of the sewage in the lower parts of the city. This fault, of course, was not incident at all to the system, and was an oversight in proportioning the mains, and would not be felt during an ordinary winter.

"*Second.* The omission of man-holes in the mains, as well as means of opening the small pipes without breaking them, to remove obstructions which will sometimes occur. These omissions are now being remedied. Man-holes being constructed at every five hundred feet on the mains, and when a section of small pipe is broken into, it is replaced by a T shaped section, with a lid on the top, of the upright stems of the T, which can be readily removed and the cleaning tool introduced. When these improvements are made, the system will be very complete. The want of size in the mains, should it become an annoyance, can only be remedied either by duplicating them or rebuilding them on a larger scale. I think an error has been made in not using the fresh-air inlets, as originally intended, at the junction of branch sewers with the mains. They are useful for ventilation and observation."

CONCLUSION.

In obedience to the resolution of this Board I have endeavored by the examination of foreign and American experience to determine what method of sewerage we ought to recommend to the towns and cities of this State applying for advice. I am convinced that both in England and in America large, combined sewers for carrying storm-water and sewage are and necessarily must be constant and powerful sources of disease; and that for most towns, they are a very costly method of removing sewage.

I am of the opinion that the separate system of small sewers avoids in great measure the inherent sanitary difficulties of the combined plan; and that it is an efficient and economical method of removing the sewage of towns. I therefore recommend the State Board of Health to advise the adoption of the separate system of sewage in those towns which have asked for information on this subject.

Respectfully submitted,

JAMES T. GARDINER,

Chairman of Committee on Drainage, Sewerage and Topography.

At the quarterly meeting of the State Board of Health, held at Albany, February 8, 1881, Mr. Jas. T. Gardiner, one of the members of the Board, and chairman of the committee on drainage, sewerage and topography, presented statements supplementary to his report on sewerage of the smaller cities and large villages, as presented to the Legislature in the Board's second annual report, setting forth urgent reasons for the adoption of the "separate system" of sewerage, with daily flushing.

The following preamble and resolutions were adopted by the Board and ordered to be published:

WHEREAS, Many cases of disease directly traceable to contamination of water and earth by the soakage from privies and cess-pools have come within the knowledge of this Board; and

WHEREAS, Disease from this cause will continue to increase more and more rapidly unless action is taken to avert the evil; therefore be it

Resolved by the State Board of Health:

1. That the use of privy vaults, privy-pits and cess-pools is seriously affecting the public health.

2. That all excreta should be removed from the neighborhood of human dwellings instead of being stored up near them in pits, vaults or pools, to poison the water, earth and air.

3. That in villages and cities this removal of excreta should be done by the local authorities, who shall be responsible for its proper performance, and in isolated localities by the individuals interested.

4. That this removal of excreta may be cheaply and healthfully done either by "dry-removal" or by "water-carriage."

5. That we recommend the method of "dry-removal, called the tub or pail system," as the best for villages, hamlets and isolated dwellings which are without water supply, or have not the means to build sewers.

6. That towns having proper water supply should be provided with a system of small sewers adapted to carry only sewage, including excreta, slops and waste-water, and excluding storm-water, which should be taken care of separately.

7. That the costly plan of large combined sewers, for carrying sewage and storm-water *together*, has proved a sanitary failure both in England and in this country; while the "separate system," when properly constructed, avoids in great measure the evils from sewer-air, now so common, and is much less expensive for most towns.

8. That the "separate system of sewers," with flushing tanks, is hereby recommended for general use in this State.

Published and distributed in answer to requests for information.

By order of the Board,

ELISHA HARRIS, *Secretary*.

REPORT OF THE COMMITTEE ON EFFLUVIUM NUISANCES.

On the 6th of January, 1881, a memorial from citizens of the city of New York praying the Governor to require the State Board of Health to investigate and report upon stench nuisances at and near Hunter's Point, was transmitted by Governor Cornell to this Board.

The Memorial of Citizens:—The following memorial, signed by Messrs. Howard Potter, Charles P. Daly, James Gallatin, Alfred C. Post, M. D., C. R. Agnew, M. D., and one hundred others, was presented to the Governor, and by him referred to the State Board of Health

To Hon. ALONZO B. CORNELL, *Governor of the State of New York:*

The undersigned, residents of the city of New York, beg leave to call your attention to certain things which in their judgment constitute a nuisance affecting the security of life and health in this city; namely, the noisome and offensive smells, generated either at Hunter's Point and other places on Long Island by agencies unknown to your petitioners, which are brought into this city by winds and other natural causes; or else arising from the carrying on of offensive trades in the said city.

Your petitioners represent to your Excellency, that the local Board of Health of this city has failed to procure the abatement of this nuisance, and that the same is in their judgment a proper subject for examination by the State Board of Health under the requisition of your Excellency, pursuant to the act of the Legislature known as chapter 322 of the Laws of 1880.

Your petitioners respectfully ask that your Excellency require such examination.

Dated NEW YORK, *December*, 1880.

At the quarterly meeting of the State Board of Health, at Albany, February 9th, 1881, the above memorial, signed by 105 citizens of the city of New York, was referred to a committee by the following resolution:

Resolved, That a special committee be appointed by the chair to proceed to New York city to take testimony with regard to the nuisances alleged to exist there in the petition of citizens referred to this Board for examination by the Governor, under date of January 5, 1881, and that this committee be authorized to employ a stenographer, and such experts and agents as may be necessary to complete the investigation. That the memorial of citizens, with the reference of the Governor, be

referred to this committee, and that such special committee report to this Board the evidence taken with their conclusions thereon, with all convenient dispatch.

The three State commissioners were appointed to be such committee for this investigation: Dr. J. Savage Delavan, chairman, Hon. Erastus Brooks, and Dr. Elisha Harris.

PRELIMINARY STEPS.—After several public hearings by the committee in the city of New York; and after personally inspecting all places known or suspected as sources of the nuisances complained, such expert services as were deemed necessary in certain chemical investigations* were engaged; while in its proceedings the committee had the advantages of the testimony and recent records of the health authorities in Brooklyn and New York, and also had its own memorandum of information carefully arranged for practical uses.*

On the 15th of April the committee transmitted to the Board a report of its proceedings and conclusions; and, on the 16th, the Board adopted said report and ordered it to be presented to the Governor.

REPORT.

To the State Board of Health :

Agreeably to the appointment of the President of the State Board of Health at its meeting, February 9th, 1881, the special committee on "effluvium nuisances," proceeded to New York to take testimony from those petitioners who had made special complaint to His Excellency, the Governor of the State, concerning such alleged nuisances, due notice having been given to each petitioner. The committee held three sittings at No. 79 Fourth avenue, at the rooms of the Association for Improving the Condition of the Poor, on February 23d, and 26th, and March 3d.

The testimony taken at these hearings of your committee, both from those petitioners and others who were present and personally gave evidence, as well as the written testimony in answer to certain questions received by the committee while in session, is presented in full, with this report. After this testimony had been duly considered, the committee made a tour of inspection and investigated the sources of the nuisances complained of, on the 26th of March. They have also caused special investigations to be made by experts, both as regards sequestered nuisances; and also concerning the chemistry of stenches, as understood at the present day. They herewith present their report to the State Board of Health, together with an abstract of the testimony taken, a special report of a chemical expert, also the conclusions reached after due consideration of the testimony and the results of their official visit to the localities and industries complained of.

J. SAVAGE DELAVAN,
Chairman of Committee.

* See abstracts of papers appended to this Report.

The special committee for investigating stench nuisances has listened to, and recorded, a large amount of voluntary testimony, and so far as at present informed, the members of this committee are unanimously agreed that offensive odors are frequently noticeable over a great extent of the districts of the city of New York, and that they are borne upon the atmospheric currents from the south-eastward crossing the East river, and not unfrequently, as far westward as Broadway and 6th and 7th avenues. Mr. Frederick Law Olmsted, whose testimony is of the highest trustworthiness, states that the stench nuisance from the south-eastward is borne to his residence in 46th street, between 7th and 8th avenues.

The voluntary testimony thus far taken presents a certain number of points and some conclusive testimony respecting the effects produced upon those who complain of the odors and of the necessity which they create, wherever smelled, for the closing of doors and windows on the windward side of their houses. The committee regard this as good and substantial evidence that the nuisance complained of is a nuisance against health. No effort need be made to find what particular disease has been produced by any such nuisance, the effect upon the nervous system, and the disturbance of the comfort and mental peace of individuals in vast numbers of families, who are helpless to defend themselves in any manner without removing far from their present residences, are facts well proven. The committee would attach great importance to this fact, and allow it to stand by itself, as others are being settled by the evidence received.

The localities from which the greatest number of complaints and the most emphatic and well defined statements concerning these stench nuisances come must be regarded as important. Thus far they have been chiefly between 38th and 59th streets, on the East river side, and as far westward as 7th avenue.

The following abstract of certain points in the volunteer testimony taken by the committee comprise: *First.* Points upon which all agree, among upwards of one hundred who testified by written statements. *Second.* Verbal testimony, given in response to questions by the committee.*

THE WRITTEN TESTIMONY.—All agree in their answers concerning the nature of the stenches that kerosene, sludge acid, or sludge, putrid animal odors, ammoniacal sulphurous gases, or vapors are oftenest noticeable; that in the city of New York these odors seem to come from the eastward and south-eastward; that they are noticeable across more than half the width of the city, from eastward to westward; that they vary in intensity greatly at different parts of the day, and on different days, but are smelled at all hours, though most at evening; that they cause nausea, and that numerous persons are made sick in consequence; that invalids and feeble persons suffer most.

The committee quote from the numerous written statements the following, which illustrate quite correctly the whole:

Dr. C. R. Agnew, whose family residence is at 266 Madison avenue, corner of East 39th street, writes that his family suffers at all seasons, and at all hours when the wind is from the right quarter, east or south-east; that the odors at his house are most noticeable at his front win-

*An abstract of a memorandum which was prepared in committee, to facilitate its work, is appended to this report marked [A].

dows and doors; he would term them kerosene smells; that "they are sources of sickness by causing windows and other ventilators to be closed, and by their depressing effect upon health, and by unpleasantly affecting the nervous system in various ways." He further testifies that "a bad stench is a source of disease, because in many ways it vexes the nervous system of sensitive people."

Dr. Thomas F. Cock, whose residence is at 14 East 40th street, between Fifth avenue and Madison avenue, testifies: The stench is noticeable all over Murray hill when the wind is from the south-east; they are traceable to the region of Hunter's Point; that they aggravate sickness and affect all persons of cleanly habits; that during his summer travel upon the Long Island railroad, several distinct sources of stench are recognizable and are excessively offensive.

Dr. J. L. Higgins, of 23 Beakman place, opposite Hunter's Point, testifies: That in his locality the odors create an increased sickness; "frequently," he continues, "I have had to leave my house and go to another portion of the city for temporary relief where supportable air could be found; in the summer we have to close all the windows at times and exclude the odors."

Dr. J. M. Hills, of 438 Madison avenue, testifies: That in the region of his residence bad odors are noticeable at all times of the day; that they are most intense from 30th to 50th streets, from the river side to Madison avenue; that the odors "are intensely disagreeable and suffocating."

John M. Drake, Esq., of 4 Beakman place, near East 48th street, testifies: That the odors are most offensive afternoons and evenings, and at the west side of the dwellings; that the "smells are those of 'sludge,' phosphates, and slaughter-houses, of which there are several in this immediate vicinity."

Dr. J. D. Trask, Astoria, testifies: That the stench is noticeable at all hours; that his residence suffers most when south and south-east winds prevail; that the smells are sickening; that they cause and increase sickness; that his wife, sons and daughters alike testify to these facts.

J. H. Montgomery, Esq., of 13 Prospect place, East 41st street, testifies: That the odors are intense at his place of residence, and westward as far as Fifth avenue, to his certain knowledge; that "the smell is like decomposing matter and *offal stench*," which "must be smelled to be appreciated;" designates them as coming from fat-rendering and fertilizer factories; that he is not only compelled to close his windows against suffocating stench, but has been broken of rest night after night; that they cause sickness most emphatically.

Signor Mendelshon, residing at 2 Prospect place, East 41st street, testifies. That the smells seem to come from Hunter's Point, petroleum refineries, and from fat-rendering establishments; that the stench is sickening and foul, reach his residence from the east; that they cause nausea and an inclination to vomit; that they produce sickness in his family; that in summer they are most offensive and compel people to keep their doors and windows closely shut.

Dr. Buttles, residing at 28 East 28th street, near Fifth avenue, testifies: That the stench from the east reach that part of the city at all seasons, and at any hour of the day or night; that they are offensive the whole distance from 23d to 90th street; that they are disgusting

and sickening; that cases of sickness are often traced to this cause. The doctor gives the names and residences of those patients who have suffered sickness from this cause in the region of the city here mentioned.

Dr. L. Bolton Bangs testifies: That the stench is noticeable at 23d street, and far northward; that at times they are intolerable; that they are worse with an east wind; that they cause nausea and headache, and an extreme sense of suffocation; that they increase prostration in those who are sick, and are especially injurious to patients sick with fever or any lung trouble. The doctor gives names of sufferers.

Mr. E. Tatum, residing at 244 East 15th street, near the Friends' schools and meeting-house, testifies: That there is greatest suffering in that region at low tide, when the winds are easterly.

Dr. John C. Peters, residing at 83 Madison avenue, near 29th street, testifies: That these stench is most noticeable from 23d to 50th street, on the eastern side of the city, and as far westward as Fifth avenue. He testifies that ladies are made wretched by the stench; that they are waked up from sleep by them; that they undoubtedly cause sickness. He gives names and residences of a number of sufferers living in the region here mentioned.

Dr. Hitchcock, of 8 Beekman place, above East 48th street, testifies: That the violence of the stench is indescribable; that they are most apparent when dense volumes of black smoke issues from the oil refineries; that they reach his residence from the east and south-east, blowing directly across Murray hill; that they produce sickness and depression in him and in many of his neighbors; they also cause sickness — not specific diseases and fevers — but sickness.

Dr. Estabrook, chief of staff of the Charity Hospital medical service, testifies: That the odors are noticeable at all times and seasons when the southerly winds prevail. The hospitals of which he has charge are directly north from Hunter's Point and Newtown creek. He adds "that the stench coming from Hunter's Point is often so charged with acid fumes as to be exceedingly irritating to the lungs and throat, and to compel the closing of doors and windows during hot days.

George D. Bleything, residing at 175 East 78th street, testifies: That at his house great suffering is experienced from the stench when the wind is from the south or from the south-east; that they are compelled to close their southern windows, even in the most pleasant weather, to shut out the nauseating odor.

Dr. Charles Milne, residing at 144 East 45th street, testifies: That the stench produce sickness, especially in children, and in all invalids to whom fresh air is most essential.

Dr. W. H. Hall, of 129 East 54th street, testifies: That he traces sickness in numerous families to the stench; that these stench are "active factors in generating disease."

Dr. Andrew H. Smith, of 22 East 42d street, testifies: That these stench afflict the whole east side of the city above 23d street; "at times they are suggestive of petroleum, at other times of rancid, putrifying fat;" they proceed from the direction of Long Island City; that they cause nausea, headache; that they impair appetite; injure persons of delicate stomach; aggravate diseases of debility; that they have often wakened him out of a sound sleep during a sudden change of wind which brought them into his open sleeping-room.

Dr. Albert H. Buck, of 109 Madison avenue, near 30th street, testifies: That the smells consist of "sickening odors penetrating every part of the house;" they are always eastward; they are injurious to infants and delicate persons.

Mrs. J. M. Fisk, residing at 999 Fifth avenue and 70th street, testifies: That the stench is most oppressive at her residence in the afternoon; that they seem to come from the petroleum and the bone-boiling works from across the East river; that at times the house is suddenly pervaded by them; that they cause sickness; compel closing of windows.

THE ORAL TESTIMONY.—In language like the foregoing the complainants have voluntarily given testimony in writing, while the verbal testimony has been given in the presence of the committee in terms even stronger, in connection with many details, which, taken at a justifiable estimate, are valuable and significant, certainly, leaving no doubt as to kinds and degrees of sufferings experienced by many of the inhabitants in the central districts of the city of New York.

The total number of persons whose testimony is given in their own handwriting is fifty-eight, and the number who appeared voluntarily and gave verbal testimony, which was stenographically reported and has since been written out in full, is thirty-one. This body of evidence is available for future use, but is not here presented.

Names or designations given to the stench complained of.

Sludge-acid, or sludge, sulphuretted gases, stinking gases, petroleum smells, putrid odors, ammoniacal gases, fat-house smells, offal rendering, bone-boiling, bone-burning, superphosphate fertilizer factory stench, manure heaps and manure dumps, are the designations given in testimony. The name of the spent, or waste, acid, known among the people as sludge acid, has become most common in the mouths of complainants. This is natural, for it appears from the records of proceedings against fertilizer factories, during the past several years, under orders from the Board of Health of the city of New York, and under orders from the Board of Health of Brooklyn, that the intensest nuisance is caused by this waste acid—a resultant of the process of the agitation of sulphuric acid with the distilled kerosene. It has been proved to be the most intense and persistent of the stench, and it has become widely known by common repetition and disrepute of its name, but is often, as the committee believes, applied quite indiscriminately to the total of stench nuisances observable on the high grounds of the central district of New York city. Other stench as described, and as quite conclusively verified by the committee under its own inspection, as well as by special testimony which came from experts who have had an opportunity of acquiring a correct knowledge of the nature of the nuisances complained of, may be correctly mentioned in the following order:

1. Offensive odors of putrescent animal matters in the nature of offal, putrid fish, and fish-scrap, as well as all other animal scrap in a moist, putrescent state.
2. Gases and effluvia resulting from the contact of sulphuric acid, pure or impure, with such materials and other phosphatic matter, as witnessed in the superphosphate factories.

3. Gas and vapor arising from cooking or burning of fatty animal matters, whatever the process may be, especially the bone-boiling and offal rendering as witnessed on Newtown creek near Hunter's Point.

4. The escape of vast volumes of unconsumed smoke from whatever sources, where oily and fatty, tarry or any kind of animal or offensive organic matters are being partially and unskilfully burned, and allowing the escape of smoke and vapor into the atmosphere, unconsumed and unneutralized, as seems to have been witnessed from the beginning of these complaints, in connection with almost every kind of refinery where these substances are undergoing distillation or vaporization by heat. The open exposure of offal and other putrid matters, and the slovenly manipulation of common manures and fertilizers as witnessed upon the New York side as well as upon the Hunter's Point side; the running of offensive waste materials into the affluents of the East river, and even into this river itself, which has been going on for many years until a deposit of vile mud and sedimentary matter and slime is now smearing many miles of the tidal banks of Newtown creek and its estuaries, as well as some portions of the East river side, and not a few of the sewer outlets and the slips and docks.

5. Temporary and apparently surreptitious attempts to manipulate the sludge acid and other matters that produce foul and far-reaching stench at various points along Newtown creek; the neglect of proper rules and regulations for the stoking and maintenance of furnace fires in connection with nearly all the establishments that are accused of these nuisances; the exception to this neglect being of quite recent date, and in the few larger works as witnessed in the kerosene establishments that have succeeded in overcoming this evil.

This series of stench, and these causes of them, have acquired a magnitude that can hardly have been witnessed elsewhere in the world; for the businesses with which they are connected are, with few exceptions, conducted upon an enormous scale. The kerosene works illustrate this fact, so do the superphosphate manufactories and the restoration of sludge-acid works. Therefore, the whole subject possesses an importance which the petitioners to the Governor have not overrated in their memorial.

Identification and description of them.

A few of the witnesses who have borne voluntary testimony have confidently asserted that they smelled at various times odors that they could specify. This may have been true in their experience — the stench from burning fats and bones, from superphosphate factories and the sludge vapor, from petroleum stills and from gas house purifiers, are separately distinguishable. Yet where numerous vapors and gases are combined as they float in the atmosphere, it cannot be considered necessary in establishing the fact relating to nuisances, that each of the polluting agents in the air shall be positively identified and separately named. It would be asking too much. The committee's personal observation, and the testimony of the most trustworthy of the witnesses alike establish the fact that most of the sickening and offensive vapors that are smelled in the vicinity of Hunter's Point and on the New York side, opposite, are *combined* effluvia which should be accredited to sev-

eral causes that are in operation at the same time. There is no doubt, however, that there are certain odors and odorous vapors which are much *more persistent* and which *float farther* than others, undiminished or undestroyed as respects their offensiveness and character as stench. The evidence seems conclusive that this is true of naphthous and certain other special vapors from petroleum oil under treatment by heat or by acids, and such stench is doubtless as infinitely variable and combined as their chemical changes and characteristics are. It seems to be equally true that the offensive odors from putrid animal matter, and the vapor from the rendering of fats and from bone-boiling and bone-burning establishments, are readily conveyed long distances by the atmosphere with all their pungency and sickening odor. Ammonia and sulphuretted hydrogen, of course, are not conveyed to any great distance; for, as their chemistry proves, they are rapidly absorbed by moisture, and thus diluted and combined and at last rendered imperceptible to the senses. Yet these are offensive enough in the neighborhood where produced, as was witnessed in the vicinity of the Standard Ammonia Works, visited by the committee.

The most pungent and suffocating of all effluvia smelled by the committee, or complained of by those who have testified, are those from sludge-acid and from the superphosphate establishments.

According to the testimony of Prof. Nason, and from what the committee judges to be true from its own examinations of the establishments, the heated vapors which hitherto — until quite recently at three or four of the kerosene works — have been given off during the process of "blowing out" and cleansing of the great petroleum stills (of which there are a hundred or more in operation, each with a capacity of from 300 to 600 barrels) produce the most far-reaching and intense of the effluvia connected with the kerosene works. The Empire, the Standard and the Pratt Astral Oil Works now demonstrate the fact that *this source of nuisance is, and should ever be, completely prevented*; and that by a simple system of hoods and connecting tubes, aided by a suction chamber near the terminus of the collecting tubes, all such vapors are drawn away and blown into a heated furnace, as useful fuel. By this simple and effective process the committee witnessed the control of what was, until recently, one of the chief nuisances of kerosene works.

Alongside the Standard and Empire Oil Works, the mixing and exposure of superphosphate fertilizers is carried on. Near the foot of Eighth street, on the East river, Long Island City, pungent and sickening odors were smelled at a distance of several hundred yards, and were more intense and offensive than all of the odors noticeable about those two largest of the petroleum refineries. The claim that has been occasionally alluded to, if not positively asserted, in the course of the testimony received by the committee, that the commercially pure sulphuric acid used by certain superphosphate manufactories has prevented all nuisance from such exceptionally well-conducted places, does not seem to be well founded; for at one of the largest of these establishments on the Queens county side of Newtown creek, at which it was found that clean commercial acid was being used, of about 55° (Beaumi test), the committee found the atmosphere of the place densely loaded with the offensive effluvia characteristic of the superphosphate manufacture.

Combination of various effluvia.

The committee need only show upon the chart of the nuisance districts how the whole series of effluvium factories and materials is distributed along the lines eastward from the East river, opposite the central regions of New York. Any effluvium that pertains or attaches to heated vapors or gases may be floated westward, eastward, or in any direction, for a considerable distance, whenever the vapors with which it is connected are sufficiently heated to permit the whole to be wafted onward in a given moving stratum of the atmosphere. Under such circumstances it is not *one stench alone*, but necessarily a *combination of all the stenches* that reach and float in the moving current of air, and the question how far they may float onward together seems to have been determined by an unpleasant experience of thousands of inhabitants of New York city. The varying amount and intensity of the effluvium nuisance and of the share which each one takes in the total, are points on which we have no other evidence than that which is presented in the testimony and statements which the committee is now prepared to submit. On particular days in the week, and at particular periods of the same day, the mixing of sulphuric acid or sludge acid with the animal and earthy matter, which constitutes the phosphatic and ammoniacal basis of the fertilizer, may be in full operation, and at all other times no such mixing of acid will be going on. In like manner ammonia factories may carelessly, or by accident, set free great volumes of ammoniacal and sulphuretted vapors, heated or otherwise, from certain parts of their buildings, or at the water-surface, or beneath the surface, as it is undoubtedly, as asserted, a frequent occurrence. In like manner also the manipulating of the sludge, outside of closed metallic tanks by which *the well regulated kerosene works do now control this dangerous nuisance*, will necessarily evolve the terribly disgusting stench that pertains to this substance when in contact with water or moist materials; and, added to all these, there may be, and certainly often are, dense volumes of smoke and offensive vapors evolved from other establishments in the districts in which the stench is produced. These, taken together, make up the total stench nuisances against which the people are protesting.

This committee feels warranted in the assertion that fully ninety per cent of the total nuisance of stench complained of is the direct result of needless and culpable negligence, and failure to adopt and enforce suitable rules and regulations, and to introduce well-known approved means for controlling and preventing such nuisances.

CONCLUSIONS.

1. *Concerning Refuse and Waste Materials from the Cities.*

All such matters need to be removed as thoroughly and as promptly as possible, for the protection of the health and comfort of the people. The value of the materials themselves requires that this should be systematically done, and done without waste. Animal and vegetable matters in the form of garbage from kitchens, markets and butcheries seem to be imperfectly disposed of, and that which is subject to the processes of rendering, bone-boiling, and bone-burning is not carried sufficiently far away from the built-up districts. The methods of utilizing waste

materials are rude and nasty; there is little effort made to prevent nuisance from this class of substances. The removal and general control of manure from the stables and dumps in the cities have not been subjected to complaint by any of the voluntary witnesses excepting those in the vicinity of Long Island railways, upon which the manure from New York is accumulated. The committee has obtained evidence that the sources of nuisance from the manure of New York, as regards its daily removal and methods of shipment, show that there should be no nuisance wherever publicly complained of, because all these processes are already greatly improved in the regulations put upon them, and can be made inoffensive.

Accumulations of manure upon any docks, or along any passenger railways, as at present witnessed in Long Island City, will need to be prohibited. The question of the more distant and sequestered storage of such material should be promptly settled; not only are the three cities, but millions of people who travel upon the railways and ferries, are interested in this. In like manner, thousands of inhabitants of New York may be needlessly annoyed by any one of the manure dumping and mixing yards, wherein vast quantities remain improperly on storage for months, close by densely populated streets. The whole business of manure storage should be farther and sufficiently away from the cities and all populous neighborhoods, and away from close proximity to great passenger railways, ferries and stations. Local Boards of Health should adopt and enforce uniform and strict rules against this filth nuisance.

The committee can safely express as its own conviction and judgment, that the chief and most noticeable sources and causes of offensive effluvia, whether in the nature of gases, vapors, smoke, or any kind of stench, are found to depend upon preventable kinds of neglect, carelessness, ignorance and nastiness; that some things are, in their very nature and condition of putrescence, so offensive and injurious, that no excuse can be found for permitting them to remain in the presence of any city or populous place any longer than is necessary for securing their promptest removal; that as regards the substances, businesses and methods which can be rendered inoffensive, whatever their possibilities of producing stench and defiling the atmosphere may be, when neglected or improperly managed, the committee finds it a duty to ascertain what the best experience and evidences are that such offensiveness may be entirely prevented by those who have the management of the same; that what is now found to be entirely practicable in preventing and controlling such sources of nuisance should be fully understood, faithfully enforced, not only by the sanitary authorities, but by the managers of all such materials, businesses and methods; that such causes of nuisance as are not so proved to be manageable and preventable should be removed to a sufficient distance from the population that are helpless to prevent and avoid the stench, as to cause no offense excepting to those who are concerned in such management and business.

2. *Concerning the Oil Refineries.*

The committee finds that causes and sources of intense and much complained of stench from petroleum oil works seem to have existed,

for many years past, along Newtown creek and the East river side of Hunter's Point; it has also been proved that, in consequence of persistent pressure brought to bear upon the largest of these oil companies by the Health Board of New York city, these companies have recently begun to institute important improvements both mechanical and administrative throughout all their refineries. Scientific and experienced men employed by some of these companies at present concede all that has been asserted regarding the offensiveness of certain products and processes in the refining business. There is good evidence that no small part of the causes of such offensiveness is well understood by the men who manage the refineries. The clearing out and steam "blowing" of heated stills may be quoted as evidence of knowledge and cause of evil which, until recently, has not been controlled. Close hoods and suction conduits are the simple and quite effectual methods now of controlling this source of nuisance, and their adoption at the Standard, Empire and Pratt refineries sufficiently attest the controllability of this evil.

Sub-surface tubular drainage for the recovery of waste oily matters upon the premises of the refineries is proved to be entirely practicable, and this is a source of protection from nuisance and from conflagrations. The greatest and yet the simplest of all the achievements for preventing the nuisance from "sludge," is witnessed in the closed metallic tanks, which are floated near to the refineries for the reception of the foul, sulphuric acid known as sludge. Yet great as this improvement is, and obviously necessary, the committee witnessed the open conveyance of a horse-cart loaded with a huge tank for transporting sludge-acid from some neighboring reservoir of that stuff, and to a still more nasty and wanton exposure of the same in the process of steam-heating, wrongly called *refining*, on the Brooklyn side of Newtown creek. The absolute control of the sludge as fast as produced at the kerosene "agitators;" its removal to suitable distances from the built-up districts before exposing it in the process for the recovery of the sulphuric acid, which is simply the removal of the foul material that it has taken to itself in the great agitating tanks of the kerosene works — indeed, before exposing and manipulating it in any manner — is so plain an obligation of the parties who produce or possess it, that the committee believes it is the duty of every local Board of Health (and if need be, of the State government) to declare a neglect to do this to be a misdemeanor. A small quantity of this abominable material when mixed with water or exposed to vapor or heat in the open air, or when it is being mixed, or stored in a moist mixture with earthy, animal or vegetable matters, sends forth effluvia that ought not to be endured, and must be prevented.

Escape of light oils which are vaporized in various ways and wasted in the atmosphere during the process of distillation, or open exposure of them in various manipulations of the refineries, etc., is all unnecessary and should be prevented. They are not too offensive, perhaps, to be endured, but this is a needless source of nuisance, and has had its share in making up the total of what is known as the oil refinery nuisance. A complete control of all these things is witnessed at several of the refineries already described in the committee's report.

The escape of offensive waste material into the waters or upon the water-sides has been a filthy and wanton abuse of riparian privileges which the interests of commerce have generously accorded to the petroleum

refineries and oil companies, and all workers in waste material in the Hunter's Point district. The local Boards of Health in charge of the sanitary interests of these districts are in duty bound to regulate and effectually enforce all necessary regulations concerning this matter.

Ammonia works.—The committee regret that the one great ammonia establishment visited, on the northern shore of Newtown creek, was, in some respects, in an offensive condition. Worst of all, the drainage and mechanical works were found inadequate to control the nuisance liable to be created in the manufacture of aqua ammonia, sulphate of ammonia, nitrate of ammonia, sulphuric acid, and other chemicals which are there manufactured in vast quantities.

Superphosphate Fertilizer manufactories.

The stench that emanate from the superphosphate materials in the processes of mixing and preparation are so intolerable to all persons except the few who work at the business, that the first question is, May this kind of nuisance be properly permitted in the near vicinity of a populous district? The next question is, Can this business be so regulated and controlled that its offensiveness will be so diminished as to prevent it from becoming a nuisance? The committee deem it entirely just and dutiful to answer the first question by saying that as now and hitherto managed, under the known circumstances that embarrass the executive action of sanitary and other municipal authorities, all the superphosphate and other fertilizer works that manipulate waste animal or putrescent vegetable matters are liable, and almost sure, to be offensive nuisances; and, further, that the mixing and preparation of phosphatic materials with sludge, and even with ordinary sulphuric acid, is sure to set free certain intensely offensive gases and odors. These circumstances warrant the positive exclusion of this class of stench-producing factories from the cities and from populous neighborhoods. This should be a strictly observed regulation of every city and village. The answer to the second question is an important one for all who manage the kinds of business here referred to. The application of methods for the control and prevention of nuisances must rest with those who have their gains in them, or with the public authorities of the communities that become responsible for the presence of such business in city or village.

The committee finds that the superphosphate and fertilizer factories, and the mixing and preparation of the fertilizers in every establishment for that business which it has visited, and concerning which it has taken testimony, are nuisances that ought to be removed and wholly excluded from city and village limits.

In view of this conclusion the committee recommends to the State Board of Health that an official report to this effect should be made to the Governor.

This committee also recommends to the Board that the exposure of "sludge-acid" in any manner, or by any means that permits or causes the escape of offensive emanations from it, or from the materials with which it comes into contact, ought to be strictly prohibited and prevented within the limits of the cities, and within a mile of any populous neighborhood, unless all emanations from the sludge, and such materials, are consumed in highly heated furnaces.

The committee also recommends that wherever, within the limits of any city or village in this State, or within two miles from the limits of

any city or village, the business of storing, distilling or refining petroleum, naphtha, kerosene, or coal tar, is undertaken or permitted, it should be the duty of the local Board or Boards of Health of all such cities or villages, and it may be of the other proper authorities, to require and enforce obedience to regulations which shall secure the complete combustion of all vapors, gases, smoke and effluvia, produced by or in connection with such business, and otherwise liable to be set free in the atmosphere.

The committee would further recommend that this rule should be applied as a general law as well as a local regulation, against all offensive gases, vapors, smoke, and effluvia emanating from other manufactories, when declared to be nuisances, except so far as any of the offensive emanations complained of may be completely neutralized and rendered inodorous and innoxious by chemical and other means employed upon the premises where they are produced.

Finally, this committee recommends that the State Board of Health shall officially advise and aid the local Boards of Health concerned in the suppression of nuisances described in this report, to adopt uniform, consistent, and effectual sanitary regulations or ordinances for the suppression or prevention of these and similar nuisances; and, further, that any failure of such local Board of Health to complain of and proceed against such sources of nuisance should be reported to the State Board of Health, and to His Excellency the Governor, that the full force of any law against nuisances in districts beyond, but near to, the jurisdiction of any local Board of Health should be effectually tested, and that, if it shall be found necessary, statutes more effectual than those now existing should be enacted or called into operation.

The committee deems it a duty for the State Board of Health to call the attention of the local Boards of New York, Brooklyn and Long Island City to the pernicious results from the lodgment of offensive waste materials in and about the mouth of sewers, slips and eddying shoals along the water-sides of these cities, and that this is especially true wherever there are any waste animal or vegetable matters liable to be cast into the sewers, or slips, or docks.

The committee is of the unanimous opinion that not less than nine-tenths of all effluvia nuisances and matters of complaint by those who have given testimony on the subject, and as far as witnessed and investigated by this committee, can be wholly controlled and prevented by simple and entirely practicable means, the working of which the committee has carefully examined and proved to be now in operation. Therefore the committee recommends that whatever means and regulations have thus, or shall otherwise have been found to be good and sufficient, should be made a matter of obligation and necessity; likewise whatever cannot be sufficiently controlled by available means for the prevention of such nuisances within the cities, or their immediate populous neighborhoods, should be removed to a reasonable and proper distance from the populous districts, and wherever any of these establishments are found, they should, as a matter of course, be under suitable sanitary and police regulations established by local or general laws.

The committee has not been unmindful of the fact that the vast accumulations of refuse and waste materials in populous cities, day by day, require to be provided against by means approved by the local sanitary authorities. The prompt and carefully regulated removal of

all such materials from the cities is an important sanitary duty, and difficulties that have to be surmounted, in the proper performance of the duty, should be fully provided for under suitable regulations. Such provisions can be so ordered and located as to be harmless to the public health. This committee is cognizant of the chief improvement in the methods and execution of this duty in New York and Brooklyn.

CHEMISTRY OF THE STENCHES.

The committee finds it desirable to present the scientific facts which tend to explain the causes of persistence and pungency of the stench that are chiefly complained of. Text-books of chemistry being unavailable for this purpose, the special studies of Prof. Elwyn Waller, of Columbia College School of Mines, have been made available in the elucidation of a few points in this intricate department of chemical investigation. Two points of very great practical importance are established by Prof. Waller's researches, as they have been pursued through successive years, while engaged in a practical study of disinfection.

First. It is proved that the volatilizable matters and odors that are held by the "sludge" until given off when heated, in the processes of mixing the animal and refuse matters in making the superphosphate fertilizers, are readily borne onward in the atmosphere, many miles, as offensive stench, and that they cause much discomfort, and to the chemists, who are engaged in the manipulation of the sludge mixtures, they cause an oppressive headache and occasionally nausea and vomiting.

Second. That the stench from the putrid animal matters, and bone boiling, bone burning, and like businesses, are readily borne great distances by the atmosphere, and are so nauseous and persistent as to be only very gradually dissipated and destroyed, except by actual combustion.

Prof. Waller's report is here appended. See page 427.

The committee has deemed it highly important to proceed promptly and with all fairness to ascertain the truth upon each of the questions referred by the Governor to the Board, and by the latter to this committee. The evidence obtained is so conclusive as to warrant the statements made in this report, and also to show that while much remains to be learned in regard to the mechanical and engineering means for overcoming the chief causes of the nuisances complained of, and much more may yet be contributed to the useful applications of chemistry, there will be no necessary hardship inflicted upon any persons by the abatement of these nuisances. The health and comfort of two millions of people and of millions of travelers require that these nuisances shall be prevented.

Respectfully submitted to the State Board of Health.

Special Committee } J. SAVAGE DELAVAN,
ERASTUS BROOKS,
ELISHA HARRIS.

ALBANY, April 15th, 1881.

At a meeting of the Board, held in New York, April 16th, the report of the special committee was read and accepted, and its several points were discussed, after which the following resolutions were unanimously adopted :

Resolved, That in the opinion of this Board the report of the special committee upon the stench nuisances complained of in the city of New York clearly establishes the fact that the complaints are well founded, that the odors emanate chiefly from the portions of Kings and Queen counties bordering upon Newtown creek, and that they are caused by carelessness in the management of the business of refining petroleum, discharging the refuse from the oil refineries, the handling of sludge acid, the making of cream of tartar, the manufacture of superphosphate fertilizers by means of sulphuric acid, the rendering of fat, the boiling and burning of bones, the manufacture of ammonia and the transportation and storage of manure.

Resolved, That in the opinion of the Board, the managers of the Empire, Standard and Astral oil refineries, and the owners of the cream of tartar factory have shown themselves to be commendably active in their efforts to control all sources of nuisance, and with the advice of competent experts have introduced improvements which accomplish that result; therefore the Board urges upon the Governor the importance of requiring the owners of other oil refineries to adopt the same or other equally effective methods of accomplishing the same results. In the opinion of this Board, no treatment or utilization of the sludge of the oil refineries should be permitted in the neighborhood of Newtown creek, nor should any portion of it be discharged into the waters of the creek. It should be removed in closed tanks entirely beyond the populous districts, without dilution or needless exposure to the air.

Resolved, That the manufacture of superphosphate, from refuse and putrid animal matter, as now conducted, is a source of emanations which should not be endured, nor should such putrid materials be stored or transported in open vessels.

Resolved, That the improper rendering of fat, and the boiling and burning of bones, and the manufacture of ammonia constitute nuisances of great magnitude, which can be easily abated by the adoption of approved apparatus already in use in many establishments.

Resolved, That the removal of manure from the large cities, and its transportation to the farms where it is finally utilized without annoyance to the residents of the localities where it is produced, or through which it passes, is a problem involving many serious difficulties, but the Board is unanimous in the opinion that it should not be allowed to accumulate in the neighborhood of crowded localities.

On motion of Mr. Brooks it was

Resolved, That the report and resolutions thereon be re-committed to the special committee, with instructions to lay before the Governor the resolutions, and such facts connected with the report as may be deemed expedient.

On the 19th day of April the committee laid before the Governor, with full explanations and evidence, the foregoing report and resolu-

tions, for his information, and the action he might deem necessary in accordance with section 8 of chapter 322, of the laws of 1880.

J. SAVAGE DELAVAN,

Chairman of the Committee.

A true copy from the transactions of }
the State Board of Health. }

ELISHA HARRIS,

Secretary of the Board.

ALBANY, *April 22, 1881.*

The Governor immediately transmitted this report to the legislature, with the following message:

STATE OF NEW YORK:

EXECUTIVE CHAMBER,

ALBANY, *April 22, 1881.* }

To the Legislature:

A special report of the State Board of Health with reference to certain nuisances existing in the vicinity of New York and Brooklyn, which seriously affect the comfort and health of the residents of those cities, is herewith respectfully transmitted for the consideration of the legislature.

It is a notorious fact that particular kinds of business, including the refining of petroleum, the utilization of animal offal, the manufacture of fertilizers and cream of tartar, and the storage of manures, all conducted on a large scale in and near the metropolis, have been very offensive from the emanation of noxious vapors and stenches, which are denounced by the medical profession as the cause of many kinds of disease.

The recent investigations of a special committee of the State Board of Health, warrant the belief that many of the offending causes may be easily removed; at least rendered much less nauseous and hurtful than heretofore.

This subject, involving as it does the health and well-being of nearly two millions of people, is worthy of your serious attention, to the end that all necessary legislation may be secured to avert the danger now imminent.

ALONZO B. CORNELL.

On the same day (April 22), the Governor made a general order, designed to be applicable to each and all of the sources of nuisances described in the committee's report, in terms as follows:

PROCLAMATION BY THE GOVERNOR

FOR THE SUPPRESSION OF CERTAIN NUISANCES.

WHEREAS, The State Board of Health having been required by me, pursuant to law, to inquire into certain alleged nuisances dangerous to life and detrimental to public health, existing as complained, in or about New York city; and the said State Board of Health having duly reported that such nuisances, as alleged, do exist, and that they are produced by the neglect to control and properly convey away, or destroy, various offensive waste materials in the business of refining

petroleum, the manufacture of superphosphate fertilizers, fat-rendering, bone-burning and like operations done and conducted near or upon Newtown creek, in the counties of Kings and Queens, Long Island, or thereabouts, to the detriment of the health and comfort of the inhabitants affected thereby :

Now, therefore, all persons, companies or corporations owning, superintending, managing, or in any other manner engaged in refining petroleum, and in the movement and storage of the products thereof, or who transport, keep or use the substance known as sludge acid; and whoever owns or manages any premises or apparatus used for mixing, manufacturing, or storing superphosphate, or phosphate fertilizers in which sludge or sulphuric acid is employed; and whoever owns, carries on or manages any works or apparatus for fat-rendering, bone-boiling, bone-burning, or other process for utilizing waste or putrid animal matter, or otherwise engages in the manufacture of ammonia, and its salts, or other products complained of and reported by the said Board of Health to be nuisances, against health, by this Proclamation issued in accordance with chapter 322 of the Laws of 1880, take notice, that it is hereby ordered that the causes of the nuisances before mentioned and described, be by each and all of them as it may belong, prevented, removed or abated on or before the first day of June, 1881, as connected with or produced by any premises or business controlled or managed by them in singular or several.

And in case of the neglect or failure so to do by the time herein specified, official action necessary for the speedy removal and prevention thereof, will be taken in pursuance of law in such case made and provided, in the name of the people as for the removal, abatement or prevention of a nuisance against the public health.

[PRIVY SEAL.] Given under my hand and the Privy Seal of the State,
at the Capitol, in the city of Albany, this twenty-second day of April, in the year of our Lord one thousand eight hundred and eighty-one.

ALONZO B. CORNELL.

BY THE GOVERNOR:

(Signed) HENRY E. ABELL,
Private Secretary.

PROCEEDINGS OF THE COMMITTEE AND OF THE BOARD CONTINUED.

The Governor having caused his proclamation to be suitably posted throughout the districts in which the nuisances were produced, the committee continued its investigations as ordered by the Board with reference to securing compliance with the Governor's orders. It was ascertained on the sixth of June that several of the petroleum refineries had adopted such structural and administrative improvements as greatly to diminish the amount of nuisance in their business; but, as more than one-half of the refiners had not yet adopted such improvements to prevent offensive effluvia, and as all, or nearly all, were still exposing a vast quantity of spent acid, or "sludge," at the water-sides, the committee found it expedient to urge that all practicable improvements and means should be brought into operation to control and prevent all kinds and causes of stench nuisances connected with the petroleum refineries. There was no doubt of the fact that these causes of pungent odors

exceed all others together, though possibly not as offensive as the super-phosphate fertilizer manufactories. The petroleum business so greatly exceeded all other businesses in regard to liability to cause offense, and in regard to quantities of materials causing stench, that unless this vast line of industry could be controlled, even to the extent of transporting daily forty-five tons or more of sludge to a distance of ten miles from the cities, it would be in vain that the State Board continued its efforts to secure the suppression of the vile effluvia which had long been justly complained of in the central district of the city of New York.

While the petroleum refiners were continuing their efforts through the summer to overcome the sources of stench upon their premises, the ammonia manufactories ceased to produce the effluvia that had been complained of about their works, the manure dock and dumping ground, which had been a gross nuisance for many years along the northern bank of Newtown creek, were entirely cleared off and cleaned, and the business brought under new management without impairing any portion of the water-sides. All fat-boiling business east of Blissville, in Queens county, was terminated; but Blissville, which is situated in the south-eastern corner of Long Island City, upon the border of Newtown creek, continued to be a local nuisance, whether regarded as a fitting locality given up to stench-producing businesses, or with reference to each business considered separately, being occupied by fat melters, bone boilers, bone burners, swill stables, etc. None of the offensive effluvia of that place, however, was proved to be waisted to the city of New York. The place itself continued to be a great nuisance to the traveling public upon the Long Island railways, and doubtless is offensive to a certain district of Brooklyn as well as to Long Island City.

The committee's investigations were by no means confined to borders of Newtown creek. All well-attested complaints of dangerous stench in the city of New York and in the environs of Brooklyn, especially in the vicinity of Jamaica Bay, were carefully examined into, and those evils that were found important are mentioned in the pages that here follow.

Some Results of Inspection in the city of New York.

Early in July a petition from residents of Prospect place and Murray hill was forwarded to the Governor, and by him referred to the State Board for investigation. The petitioners allege that various manufacturers and premises by them mentioned between 43d and 44th streets, were sources of stench, and from these they prayed to be delivered.

Under a rule of the Board, an abstract of the facts was at once communicated to the local Board of Health (of the city of New York) and to the persons complained of by the petitioners. The city Board of Health at once investigated the subject, and forwarded the report of its sanitary superintendent. It was stated in this report that "most of the slaughter-houses, lard rendering establishments, and factories for utilizing animal refuse" are situated in the district on the east side bounded by 43d and 48th streets, First avenue and East river, and in the district on the west side bounded by 38th and 43d streets, 10th avenue and North river, also that the stable manure of the city is sent from that region of the water front. The same officer reports the improvements

effected during the previous eighteen months, and concludes by summarizing the results of the inspection in the following words:

"A careful study * * * * * shows that while on the very premises of these various establishments, and in their immediate vicinity, we must expect to get characteristic odors, yet during the time covered by this inspection, these smells have not extended more than one hundred yards from the premises where they were produced."

At the quarterly meeting, August 9th, Dr. Delavan, chairman of the committee, reported the inspection of two superphosphate fertilizer factories on Barren Island, where extensive ponds of sludge were found exposed in the open air, whereupon it was

Resolved.—That the committee on stench nuisances be directed to request the Governor to close at once the factories on Barren Island which disseminate odors of sludge acid, to the discomfort of the summer resort, and to furnish the Governor the names of the said factories and of the firms operating them.

Resolved.—That the special committee on stench nuisances be directed to request the Governor to close at once all refineries and other establishments at and near Newtown creek that permit sludge acid, tar, or any other refuse to run into the creek, or on the neighboring grounds, or allow offensive odors to escape from the same, until such time, as in the opinion of the committee, such improvements shall have been made in the factories, as will in future prevent such offensive discharges and odors.

Resolved.—That the committee on stench nuisances be directed to furnish the Governor the names of said factories, and of the firms operating the same.

Resolved.—That the committee is empowered to recommend to the Governor the entire suppression and closure of any factory or establishment in the vicinity of Newtown creek, from which a stench nuisance emanates to New York or Brooklyn, whether from sludge acid or other causes.

ACTION ON CAUSES OF COMPLAINT. CONEY ISLAND, BARREN ISLAND NUISANCES.

August 26th this committee prepared its report in the following terms, and upon informing the proprietors of the premises complained of, those gentlemen offered at once to remove all causes of complaint, and to keep their factories closed during the warm season:

The undersigned committee, acting under instructions of the State Board of Health, and by its authority, respectfully reports in regard to the complaints from Coney Island, as referred to this Board by you, that they find, and have proved that:—

First.—The factory and premises owned and managed by Mr. E. Frank Coe of New York, and situated on Barren Island, in the county of Kings, are producing a nuisance which is occasionally very offensive to great numbers of people on Coney Island. And this committee herewith present the proof in testimony and affidavits upon this subject.

This committee, having found the sludge-tar ponds that are now openly exposed upon the grounds and premises of said Mr. Coe to be a nuisance against the health and comfort of people upon Coney Island, request and recommend that said nuisance should be by you ordered to be abated and prevented without further delay by said owner.

Second.—This committee further find and have proved that a similar sludge-pond, now existing on the grounds and near the buildings of Messrs. Read (of 34 Beaver street, New York) on Barren Island, is also causing part of the public nuisance herein described, therefore, it is respectfully recommended that a like order be enforced against the same.

J. SAVAGE DELAVAN,
ERASTUS BROOKS,
ELISHA HARRIS,

Committee on Effluvia Nuisances; State Board of Health.

In obedience to the order of the Board the committee made its final report to the Governor August 29, in terms as follows:

To Hon. ALONZO B. CORNELL,

Governor of New York:

Governor—Agreeably to orders received from the State Board of Health, the special committee on effluvia nuisances have investigated the complaints that the Governor's proclamation ordering the prevention of certain stench nuisances has been, and is still, disregarded.

We have the honor to submit herewith the names of those persons and firms who are still causing said stench nuisances in defiance of the proclamation of April 22d, ult., with proofs and affidavits setting forth the manner and extent of their offending.

The committee have ascertained that the Governor's proclamation is generally obeyed, and that the oil refineries, particularly, are striving, by improved machinery and scientific and careful processes of working, to prevent all nuisances which have, until your order was complied with, been connected with the refining of petroleum.

The stench nuisances, as complained of to the Governor, are being effectually prevented, and with the prompt closing and removal of the two offensive establishments now reported to you as not complying with the order you promulgated on the 22d of April, this committee believe that the nuisances complained of to the Governor will have been mostly abated.

There still remain several local nuisances, near the head waters of Newtown creek, namely, one superphosphate factory, one bone-burning and five fat-rendering establishments, upon and beyond the rural borders of Long Island City and Brooklyn, eastward, but the evidence that they cause any nuisance to the people of New York and Brooklyn is not yet complete. Yet they are nuisances to the passengers upon the Long Island railroad, and for this reason ought to be abated. Though several miles remote from the city of New York, they are located on Newtown creek and "thereabouts."

This committee now return to you the various papers relating to complaints by people of Coney Island with attested proofs concerning preventable causes of stench nuisance that is suffered occasionally there.

The committee would state to you, that though some of the offensive kinds of business have suspended, and though even twelve great petroleum refineries are now working without causing nuisance any of them may, through neglect of supervision, again produce offensive stench, and further, it must be noticed that there are several miles of besmeared and stench producing water-sides, decayed bulk-heads,

cribs, and structures in and about Newtown and Bushwick creeks, which cause and constitute a perpetual nuisance that will continue for years, if those water-courses are not straightened, cleansed and otherwise improved.

With great respect,yours,

J. SAVAGE DELAVAN,
ERASTUS BROOKS,
ELISHA HARRIS,

Committee.

ALBANY, *August 29, 1881.*

TO HON. ALONZO B. CORNELL, *Governor of New York:*

Sir:—In obedience to directions given to the undersigned committee by the State Board of Health at the quarterly meeting on the 10th of August, inst., the following report is presented to you concerning each place and its proprietors and business that recently, and at the latest dates herein mentioned, has been found and proved to be disregarding and violating the orders and instructions made and published by you on the 22d of April, 1881:

The nuisances and the failures to comply with your orders and instructions concerning the same consist in, or are produced by, the neglect to control and properly convey away or destroy, various offensive waste materials in the business of refining certain products of petroleum, the manufacture of superphosphate fertilizers, fat rendering, bone burning, and like operations, done and conducted near Newtown creek, in the counties of Kings and Queens.

(1.) *The manufacture of superphosphate fertilizers at and near the foot of Eighth street, Long Island City, upon and within structures extending from the East river towards, and near to, West avenue, in said city.*

The business here mentioned consists in the manufacture of superphosphate fertilizers by means of mixing various animal and organic matters with sulphuric acid.

The vapors and gaseous emanations produced by, and in the processes of, the said mixing and manufacture are excessively offensive, the stench which emanates from, or with them, being very disgusting and oppressive, even at great distances from said factory and premises. Said factory and business of mixing, storage and handling are controlled by Messrs. Williams, Clark & Co.; and, further, the eastern portion of said premises is held and controlled by Mr. E. Frank Coe, of New York, and is at present used in the storage and mixing of various animal and organic materials which are used in the manufacture of fertilizers; and said materials are excessively offensive because of the stench that emanate therefrom.

Concerning the premises, substances and business here mentioned, this committee finds, and has proved that the same are held and managed in violation and disregard of the proclamation you published on the 22d of April, and caused to be served upon the persons and owners herein named; and this committee finds that said premises and business continue to be and to cause a public nuisance.

(2.) *The exposure, keeping, movement and manipulating of "sludge acid" upon and near Newtown creek.*

This committee finds, and has proved, that certain persons, or a person named Clark, and believed to be Edward Clark, or his family and associates, openly in violation of the proclamation and instructions issued by you April last, carry on the business of conveying to and upon certain premises by them held and occupied, on and near the southern bank and side of Newtown creek, in the 17th ward of Brooklyn, and near Hunter's Point, Long Island, the substance known as "sludge acid," which is there variously exposed, spilled, steamed, and allowed to remain in such manner and to be moved and changed about by such means as violate the orders given in your proclamation and instructions in regard to the matter of sludge-acid and nuisances therefrom. This committee further finds, and is credibly assured, that since the refiners of petroleum in the State of New York have refused to sell or give to the said Clark any "sludge-acid," he has obtained and received such material from refineries in the State of New Jersey, thus demonstrating the determination to continue an offensive business which was forbidden, and is a public nuisance.

To the extent, and at the places, and by the owners and managers of premises herein mentioned, this committee finds that offenses caused by them are nuisances which violate the proclamation and instructions you issued and published on the 22d of April last. The accompanying affidavits are submitted in evidence of the correctness of this opinion. And as these are the only places and offenders that this committee has now proved to be now violating your orders within the populated district of Newtown creek, and at the same time affecting the health and comfort of the inhabitants of the city of New York, these are separately reported to you. The refineries of petroleum have at last, as the accompanying affidavits and expert reports show, fully complied with your orders, and in the opinion of this committee they can and must be required so to comply.

Other businesses and premises are causing nuisances in places beyond the districts herein mentioned, and whenever this committee is able to present to you proof of any violations of your orders and the proclamation of April 22d last, this committee will promptly report the same to you.

J. SAVAGE DELAVAN,
ERASTUS BROOKS,
ELISHA HARRIS,

Committee State Board of Health.

ALBANY, August 26, 1881.

The Governor's Orders.—Upon the foregoing report and the numerous affidavits accompanying it, the Governor issued an order for the abatement of the nuisance by and upon the premises of Edward Clark and Edward Clark, jr., in the 17th ward of Brooklyn near Hunter's Point, and for that upon the premises of Messrs. Williams, Clark & Co. whose fertilizer factories and storage premises were then situated at foot of 8th street East river, Long Island City. The sheriffs of Kings and Queens counties, respectively, officially served said orders, and thereupon the sludge-separating works of Messrs. E. & E. Clark on the Kings county side of the creek, suspended operations in the day time and continued their works at night; but Messrs. Williams,

Clark & Co., wound up their superphosphate manufactory and storage on the East river side in Queens county, and removed their works to a region remote from cities.

A competent inspection was maintained until September 3d, when the causes of the nuisance were found to be abated and controlled, without the necessity of calling upon the Governor for his action.

FURTHER REPORT ON NEWTOWN CREEK NUISANCES.

SPECIAL REPORT COMMITTEE EFFLUVIUM NUISANCES.

PRESENTED AT THE QUARTERLY MEETING, NOV. 9, 1881.

The special committee appointed by the State Board of Health to investigate this effluvium nuisances in and around Hunter's Point, Newtown creek, and the water fronts of New York, Brooklyn and Long Island City, being notified of the action of his Excellency the Governor, directing the abatement of certain offensive trades and industries, made a final inspection of the location on Saturday, November 5, inst.

Accompanied by Mr. Howard Potter, president of the New York Sanitary Reform Society, and Albert L. Colby, Ph. B. inspector State Board of Health, we visited each of the twelve great oil refineries, and found that the guarantee given by Mr. Henry H. Rogers for the twelve refineries on August 29 ult., in which he, in the name of said several refineries, promises to "conduct the business of refining oil in such a manner as not to produce noisome or offensive smoke or smells; to prevent the open exposure of spent or sludge acid at any place within fifteen miles of any city in the State of New York, during the warm season, or within eight miles of any such city during the cold season; also that such impure acid shall not be allowed to flow, leak or waste into or upon the ground or streams; also, that cokes, tarry or oily wastes used as fuel shall be so perfectly consumed that no hurtful or offensive smoke or stenches shall be produced, and finally that the business of the refiners shall be so conducted as to prevent any just cause of complaint on account of any noxious or offensive smells produced by them in any manner;" this has been in process of fulfillment with the following results.

1. As regards offensive smoke and vapor from firing. Where a few months since numerous lofty chimneys were pouring forth black smoky vapor laden with offensive gases, destined to be wafted for miles to the annoyance and discomfort of the people of the environs, we found the process of firing going on without smoke. Great care had been taken in the management of stoking, and minute and careful supervision had been exercised over those whose duty it is to keep the fires fed with fuel. It seemed to the committee that the smoke nuisance had been almost, if not wholly, abated.

2. As to the nuisance heretofore existing from the escape of deleterious and noisome gases into the air during the opening and clearing out of the stills:

By a system of metal hoods and air-tight conduits, devised by Prof. H. B. Nason of the Rensselaer Polytechnic Institute, chemical expert adviser to the refineries, each still as it is opened, discharges its gases into these closed tubes instead of into the air as formerly; these are conducted by means of strong suction to the furnaces, where they are

totally consumed without any possibility of their escape into the surrounding atmosphere. It is found that the gases and vapors produced, by the opening and clearing out of one still, will supply fuel enough to heat one furnace for the space of twenty minutes — thus actually proving of pecuniary advantage to the manufacturers themselves. We regard this system, if properly attended to, as it appears to be, a total prevention of nuisance from the escape of vapors and gases injurious to health during the process above mentioned.

3. Spent or sludge acid. We found no evidence that spent or sludge acid was used or manipulated by the oil refiners. The amount produced by the twelve refineries, some forty-five tons per diem, is pumped into closed metal-lined tanks or boats without exposure to the air, and conveyed as often as need be to the distance agreed upon in the guarantee given by Mr. Rogers.

4. As to the leakage of sludge acid into the ground or into the streams:

A system of drainage has been devised carrying all water impregnated with oily or tarry material through a succession of traps, one lower than the other, partitioned by a number of diaphragms. The oily portion remains on top, being drawn off by a simple system of siphonage, and the water, purified of its harmful constituents, is then allowed to pass into the stream.

It will be seen by the above description of what has been accomplished that, by concentrated and united action on the part of the oil refiners, they are conscientiously endeavoring to comply with the Governor's orders, and the great improvements made in the system of refining petroleum without offense to the people proves emphatically what was stated to the Board by the committee at a former meeting, namely: that nine-tenths of the effluvium nuisances could be prevented by the proper application of what science has shown to be possible and practicable. The abatement of a nuisance of this kind means "the expenditure of a considerable amount of money," and certainly, when public health demands, it should be done at any cost. The oil refiners have made an excellent beginning, and the committee are of the opinion that they will continue to exercise the proper precautions, so that nuisances from this branch of industry will practically cease to exist.

Do nuisances still exist, notwithstanding the improvements made by the refiners, and in spite of the care exercised by them? Does sludge acid still continue to be manipulated and discharged into the creek at Hunter's Point?

There still remains the establishment of Edward Clark, who is engaged in the process of separating sulphuric acid from the impure material, sludge. Not being able to procure the spent acid from the refiners, he brings it from New Jersey, and is daily violating the Governor's orders in the manipulation of the vile material, and the discharging of it into the stream itself. We have ample proof of this, but also are assured that by the Governor's latest orders this will soon cease. Application has been made to the Governor praying for time to work up stock on hand from the fertilizer factory of Williams, Clark & Co., 8th street, East river, but it will not be granted, and this establishment, as well as that of Coe and others, will be obliged to close. Other industries producing various stenches, such as the bone boiling and burning, and fat

rendering establishments, are now working so that no official complaints concerning them have been transmitted by the Governor to the State Board.

Nuisances on Barren Island.

Complaints made to the Governor from the hotel proprietors on Coney Island concerning the stench wafted by certain winds from Barren Island, from the several stench-producing trades carried on at that place, were referred to this committee for investigation. It is believed that these nuisances are abated, although it has not been accomplished without much careful watching, and by peremptory orders from the Executive.

As far as this committee has had the power to investigate, advise and report, it has done so, and we feel that our work in the matter is accomplished — that each and every nuisance complained of has been minutely examined and carefully studied. Full reports of inspectors, and of experts engaged in the work of investigation, are on file, with all documents, complaints and papers relating thereto. What has already been accomplished in abating these nuisances has its history, which is ready for the inspection and action of the Board.

We believe that the people of our State owe a debt of gratitude to the Governor for his prompt and impartial action in sustaining the State Board of Health in its crusade against the preventable causes of disease and death amongst the people.

J. SAVAGE DELAVAN,
ERASTUS BROOKS,
ELISHA HARRIS,

Committee on Effluvium Nuisances.

At the meeting of the Board held November 9th, 1881, it was—

Resolved, That the special committee on effluvium nuisances be requested to prepare a complete report of its labors to be incorporated in the annual report.

Resolved, That the committee continue its work as a committee of observation, with power to employ inspectors for such localities as have been, or are engaged in, causing stench nuisances.

Sanitary Inspection in the Stench Districts.

As ordered by the Board a daily inspection was maintained in the stench districts under direction of this special committee. The exact and trustworthy information thus obtained has enabled the Board to ascertain and put on record the nature and extent of the various stench-producing premises and works in the Newtown creek region. The details relating to this inspection which was continued up to December 1st, and one branch of which is still maintained, need not here be reported; but the committee appends an abstract of certain expert inquiries and records made by Inspector Albert L. Colby, Ph. B., a competent chemist, who has made three tours thrice weekly through the petroleum refining and stench districts.

CONCLUDING SUMMARY.

This committee respectfully submits to the Board the foregoing summary of the records and results of procedures which the Board instituted and ordered in February, 1881. It is a record of work carefully organized and maintained with all reasonable recognition of the rights and necessities of every legitimate industry, and with full information concerning the facts and difficulties which must be confronted in the manipulation, storage and utilization of the waste and refuse of cities which now contain nearly two millions of people, and of the still greater difficulties that attend the manipulation and refining of nearly four hundred millions (400,000,000) of gallons of petroleum annually, all in near proximity to the very center of the metropolitan population. And this committee had, from the start, a fixed purpose to secure the intelligent convictions and consent of enlightened owners and managers of the chief of these various industries to recognize and find ways to accept the conclusions which this committee and the State Board of Health should, in the progress of the investigation, announce as necessary or dutiful for the public health.

The petroleum industries, their vastness, the commercial exigencies and the world-wide demand for the refined products of petroleum; the capitalized millions which enable a single centralized syndicate to resist or to comply with requirements for sanitary regulations of everything pertaining to the business that has hitherto produced stenches, compelled this committee to consider most deliberately the importance of every step of its procedures. Having found that the syndicate interests must be induced to lead in, and if need be, coerced, into compliance with all the practicable improvements—structural and administrative—that are now shown to be necessary in order to prevent stench nuisances from petroleum and its products, this committee conferred repeatedly with representative managers of the petroleum refineries, and on August 29, a guaranty was drawn and duly signed in terms as follows:

(Copy of Guaranty of Petroleum Refiners.)

NEW YORK, August 29, 1881.

To the Members of the State Board of Health, Albany, N. Y.:

GENTLEMEN:—In compliance with your request that a guarantee be given of the effort and ability of the refiners at, and near, Hunter's Point, to conduct their business of refining oil in such a manner as not to produce noisome or offensive smoke or smells, or in any manner to work injury or offense to the neighborhood and community at large, I, as a party interested, representing and on behalf of the said several refiners, and in consideration of the pledges heretofore made to your Board by, and on behalf of such refiners, do hereby promise and agree that hereafter the said refiners, and each of them, will prevent the open exposure of spent acid, the product of such refineries, at any place within fifteen miles of any city in the State of New York, during the warm season, or within eight miles of any such city during the cold season; that neither spent acid, nor any other offensive material used by, or the product of such refineries, shall be permitted to flow, leak or waste into or upon the ground or streams, so as to cause offensive or hurtful odors to enter the atmosphere; and that whatever cokes, tarry

or oily wastes, or other odorous substances, shall be used at or by said refineries as fuel, shall be so perfectly consumed that thereby no hurtful or offensive smoke or stench shall be produced, and that all the business of said refineries shall be so conducted as to prevent any just cause of complaint on account of any noxious or offensive smells produced by them in any manner.

Very respectfully,
(Signed) HENRY H. ROGERS.

The terms of this guaranty have been accepted and acted upon by twelve companies represented by the guarantors in good faith, and with as much success as could reasonably be anticipated. Success, however, in the constant observance and enforcement of the almost endless series of details in minutiae of duty, from the humblest stoker at the furnaces to the superintendent of the apparatus and the products of the stills, of the agitators and the storage tanks, is found to demand such intelligence as well as rigor of supervision upon every part of the refining premises as only a few of the separate establishments have yet secured. The larger of these establishments, however, have already succeeded in reaching what seems to be for the present a minimum of offensive effluvia, and all of the twelve (now fourteen) separate refining establishments, in the vicinity of Newtown creek, now succeed in wholly controlling and keeping under seal from the atmosphere all the "sludge" products, and in conveying away the same in sealed tanks, as guaranteed in the paper above quoted.

There remain all vapors and emanations from petroleum in its natural and marketable forms, and from the light-oil products of distillation, its stored distillates, its tarry residuum at the refining establishments, and from the products of combustion of the coke, tarry and other material used as fuel, and there remain also the uncovered and sodden grounds and the insufficiently protected bulkheads of a great part of the entire areas and water-fronts of the refineries. Recent improvements, as witnessed at the Standard, the Empire, at Sohn & Flemmings and the Astral companies' works, illustrate the nature and utility of the improvements that have been made in these matters.

The entire removal of all the sludge produced in the region of Hunter's Point seems to be a success beyond further criticism; yet at the same time in the midst of the refineries on the Kings county side, a manipulator of sludge for the recovery of sulphuric acid from it has continued this offensive business regardless of all the orders he has received. The total suppression of that nuisance, however, is certain to follow soon.

Safe disposal of the sludge acid.—The effluvia from the sludge acid whenever and wherever that material is exposed to water or vapor, or is applied to any animal or putrescent matter, is so indescribably odious and so far-reaching and persistent in the atmosphere and in any place reached by its foul emanations, that the nearest distance, even in the cold season, for its open exposure in any manner has been deliberately fixed by the guarantors themselves, at a distance of not less than eight miles from any city; while in the warm season the distance is fixed at a minimum of fifteen miles. Though a marketable product for the solution of bony and earthy phosphates, containing as it does one-half of its own volume of

pure sulphuric acid, the voluntary sacrifice, of the entire quantity, namely of from forty-five to fifty tons daily, marks the correct view and the public spirit of the guarantors, who know how intolerable the nuisances of sludge emanations are in the midst of or near to the city and town populations. Some of the results of attempts to use the sludge on Barren Island at the beginning of the summer, and the well-known nuisance of one sludge manipulator on Newtown creek, have sufficiently proved that it is necessary to remove this residuary product of the refineries as far as practicable from the population, which the deep tides, flowing as they do five, six and more feet, utterly fail to cleanse away.

The committee has given its attention to the conditions which demand the practical solution of an engineering problem now necessarily thrust upon the attention of the commercial metropolis of the world, because the most extensive and intolerable nuisances that have ever been smelled have been there produced, and must be abated and prevented. Nearly the entire area covered by the refineries and by the other businesses upon the water sides here described, are upon filled-in ground or made land. Three or four of the best conducted establishments have so covered, drained and cleansed the entire surface of their grounds, and so filled out upon the tide front and bulk-headed with solid facings, that the causes of nuisances we have just described are already being reduced to a minimum.

This kind of improvement must be enforced as a condition for the continuance of such businesses. Further than this, the commercial interests which now move many million barrels of petroleum, and other materials upon and through other much used waterways in front of the most populous and opulent region of the city of New York, cannot justifiably be longer neglected. The estuaries of Newtown creek and of the East river, require sanitary protection and treatment, and such skillful engineering of this problem is a condition precedent for the great improvement upon which the sanitation of an area now covering some five square miles of neglected estuary and creek surface, with the occupied and offensive grounds, depends. Newtown creek itself must in the judgment of this committee, and of the best judges that it has been able to consult, be drained, straightened, filled out and bulk-headed, in such manner as to forever protect it from relapsing into the condition it now so conspicuously occupies, in the nostrils as well as the eyes of the world, as a public nuisance.

It is not for this committee to discuss the public economy of the measures here suggested for it is a sanitary necessity; and such is the commercial value of all this region of mud and sodden filth, that, in the judgment of the committee, were a just and reasonable law, to prescribe the conditions of occupation and usage of those water fronts and low-lands, simply with reference to sanitary obligations of such ownership and usage, commerce itself would be sure to gain many-fold for the entire expenditure it would make, without the aid of public funds, for the removal and prevention of nuisance in that entire district.

This committee will not refrain from expressing the hope that at an early period the National government will carry into full effect its delayed purpose to dredge, straighten and protect the channel of Newtown creek, for commercial enterprise has already indicated the readiness and avidity with which it will meet the requirement of sanitary improve-

ment, that must soon be made obligatory as a condition of occupation, and use of the old marsh lands, and borders of Newtown and Bushwick creeks.

There will be remaining obstinate nuisances, that inhere in the very filth and foulness of the region itself, until the improvements here indicated are made throughout ground surface, and water fronts, as well as in the creek-channel.

Alkaline washings.—In their efforts to control the outflowing of the alkaline washings, which flow from the agitator that produces the offensive sludge acid, all nuisance would be prevented were it not for the fact that a considerable quantity of tarry matters, and pungent odors are held in the caustic washings, and until recent improvements demonstrated that these offensive matters could be controlled, they carried into the tidal fronts of Newtown creek and the East river, a source of nuisance that was everywhere visible. This, as shown in preceding statements, is no longer necessarily a source of complaint. Unfortunately several of the companies do fail properly to trap and control this last washing and outflow from the kerosene.

The foul borders and bed of Newtown creek.—The continued outpouring of vile residuary matters from the petroleum refineries, from knackeries, bone-boilers, distilleries and fat-melters, from rendering-tanks, from manure and garbage dumps, and from various chemical factories along the banks of Newtown creek the past many years, have left its borders, and its bed deeply covered with dense and very offensive material, more loathsome and unsubdued by storms and time, than the bitumen and slime of the Dead sea itself. The locality reeks with indescribable filth.

Further Conclusions.

(1) Whatever commercial interests may prompt and perform in the sanitary and general improvement in the regions about Hunter's Point, sanitary law and regulations should have full sway there, and to this end every manufacturer and business may need to be kept under systematic sanitary or engineering inspection adapted to prevent the various evils that are bred of neglect and inattention, or from the unsuitableness and insufficiency of preparation for the business that is being conducted offensively.

(2) That the trades and kinds of business that are in themselves necessarily, or from any cause, habitually offensive to such a distance as to be complained of in any of the populous streets of New York, Brooklyn, or Astoria (the dwelling center of Long Island City), should be excluded from the districts as herein described.

(3) The committee has obtained ample evidence that a very large proportion of all the trades and business connected with the utilization of waste materials of cities, as centralized in the region of Newtown creek, as well as the management and refining of petroleum, can be so conducted as to cause no public offense, and that this result requires adequate intelligence, rigorous enforcement of all necessary rules and practices in the works and upon the premises, and, without exception, a sufficient investment and use of capital.

(4) That the experience and good judgment of the chief capitalists and scientific men who have undertaken any share of the works hitherto

accused of producing stench nuisances, as made known to this committee, fully warrant the conclusion that they can and must be induced to lead in and insure the reforms which the public health requires and the popular will demands. The guaranty given by the syndicate of oil refiners near Hunter's Point is striking evidence on this subject, and the following words from the scientific director and chief member of one of the largest firms engaged in the utilization of waste animal products for fertilizers, a firm that has been required to close its works and remove far from cities, confirms the statement made in this committee's preliminary report in April last concerning the necessity for defining the lines beyond which all nuisance-producing businesses of kinds that are not, or cannot be controlled, shall by law, statutory and sanitary, be required to remove: "We concur entirely with the conclusions of your committee. Likewise whatever cannot be sufficiently controlled by available means for the prevention of such nuisances within cities, or their immediate populous neighborhoods, should be removed to a reasonable and safe distance from the populous districts." This representative of the superphosphate manufacturing interests further stated that in "so agreeing we are now taking steps for removal to some less populous situation."

This committee would now conclude what it has to say upon this subject by quoting the statement it made in its report to the Governor in April last, and by adding to the above statement, which has been accepted in a good degree as here shown, "wherever any of these establishments are found, they should, as a matter of course, be under suitable sanitary and police regulations, established by local or general laws."

Respectfully submitted,

J. SAVAGE DELAVAN, *Chairman*,
ERASTUS BROOKS,
ELISHA HARRIS,

Committee on Effluvium Nuisances.

[A]

Preliminary Memorandum on the Investigation of Stench Nuisances submitted February 23rd, 1881.

The nuisances to be investigated are those which produce emanations that so pollute the atmosphere as to become the cause of urgent complaints and denunciation in the city of New York; and which presumably are sources of offense in certain portions of the other cities in the vicinity of Newtown creek.

The location of these nuisances complained of in that locality is such that the offenses are alleged to be "noisome and offensive smells, generated either at Hunter's Point and other places on Long Island, by agencies unknown to your petitioners, and which are brought into this city by winds and other natural causes, or else arising from the carrying on of offensive trades in the said city."

The following sources of effluvium nuisances have been recently complained of and described by the Brooklyn Board of Health, namely: Gas works and their imperfect methods of purification, the Wallabout Oil Works, the Astral Oil Works, the Oleophene Works, the Kings County Oil

Works, Washington Company's Oil Works, Franklin Oil Works, Green Point Oil Works, Donald's Oil Works, the Standard Company's Oil Works, three to five fat rendering works, the Bristol Curing Works.*

The nuisances complained of by the New York Board of Health and by the Long Island City Board of Health, consist of the Fertilizing Company's works, on the right bank of Newtown creek; the ammonia works on the right hand,—not far east of 34th street ferry;—numerous rendering and fat melting works; various places, especially in the vicinity of Blissville; the manure docks and dumping grounds, on the Long Island City side, for manures brought from the city of New York; the petroleum refineries along the water-sides at and beyond Hunter's Point; the various factories; sulphuric and muriatic acid works, and various refineries and chemical works within the limits of Long Island City, and on both sides of the creek. Upon the New York side: the manure-docks and dump-yards on the East river side; the butcheries and fat-melting houses between 43d and 48th streets; several oleomargarine factories; the works of Messrs. Rafferty & Williams for melting and refining fats, in the same region; all the gut and tripe works in New York city; the varnish factories and filthy outflowing from about the old market establishments in the Second and Third wards of that city. Besides these there are effluvium nuisances resulting from mismanagement and defective apparatus of various chemical works, and common industries which produce vapors and smoke, or which defile the sewers with heated poisons, vapors and gases that are not yet sufficiently described in the sanitary reports of the three cities concerned in this matter. In the course of the pending investigation, some of these will doubtless be found to play an important part in the total of effluvium nuisances now complained of. Steam-exits into unventilated sewers have an important relation to the wide distribution of apparently *unaccountable odors* which enter the houses and vex the inhabitants in districts remote from sources of evils suffered.

The compound gases of which hydrogen is a constituent and a ready carrier, especially in the form of ammonia, whether alone or in other complex gases, aid the wide and rapid diffusion of the stench, and become the most common vehicle of various poisonous and offensive effluvia.

The naphthous and other light oleaginous vapors from petroleum, have their own natural laws of distribution, and are certainly readily conveyed from the atmosphere by the winds to a very great distance retaining most pertinaciously their special offensive qualities for longer and for greater distances than the ammoniacal gases and effluvia.

Compounds of carburetted gases, nitrogen, cyanogen, sulphur gases, chlorine, etc., are evolved at various places in connection with certain trades and waste materials, and are poisonous, irritating and a cause of indignant complaining by the inhabitants who suffer from them.

Sulphuric acid, which is a most convenient oxidizer and chemical agent for the purification of petroleum, and for the solving also of all bony and earthy phosphates and various other materials that have larger commercial uses, becomes an offensive carrier of vast volumes of hydro-carburetted and sulphuretted vapors that render it a cause of nuisance that is of the utmost importance, because of the quantity, extensive dis-

* Report of Health Department of the city of Brooklyn, 1875-1876; pages 123 to 128.

tribution, and disgusting offensiveness of the emanations from it. The "sludge acid," as such loaded sulphuric acid is termed, has been until recently the most intensified and indescribable of nuisances. Even at the present time, with all the improvements that are known to be practicable, and which are practiced by some of those who are responsible for it as a cause of nuisance, vast quantities are poured out upon, or beneath the tidal waters of Newtown creek at the beginning of each flood tide daily, to float as far as it may inland before the turn of tide, and then, with the returning tide, to be borne back into the East river, besmearing both banks of the Newtown estuary between Brooklyn and Long Island City.

The accusation of any one place as the source and cause of this offensive practice is in vain, until each offender is in succession detected; and so many refineries and factories have their share respectively in this aggregate of nuisances, that its suppression will require exact statements of evidence, and a comprehensive application of sanitary law. There are several other sources of effluvium nuisances of a complex nature and hidden and carefully sequestered sources, which require fearless and very faithful investigation.

The running of distillery waste and of blood and other waste of albuminous animal matter into the sewers and bulk-heads, *culs des sacs* of New York water sides, adds a vast quantity of material to the putrescent matters in the sewers and along the water-front. In summer time this is a serious source of evil, greatly augmenting the quantity of offensive emanation from sewers and bulk-head-slips.

In the plan of the investigation of effluvium nuisances, the following outline is to be followed as far as convenient:

The complaints, petitions and complainants will be examined.

The nature, location, name, extent, degree or intensity of the offensiveness which is complained of, will need to be verified.

The testimony will be divisible into knowledge and proof of what is seen and known to exist, and, secondly, into evils recognized by the effluvia complained of, but whose source and responsible producers are not positively known, yet each must be ascertained by the committee.

LIST OF SOME OF THE KNOWN CAUSES OF STENCH.

1. Manures.
2. Fats and oils (animal and vegetable).
3. Ammonia and alkali works, and gas works with their ammonia liquor.
4. Treatment of metals and metal waste, particularly in the recovery of tin, etc., from the waste material with which it is found in such processes.
5. Fat melting, and all methods of "*rendering*" fatty and fleshy substances.
6. Roasting, boiling, and burning of bone and other animal matters.
7. Accumulation and mismanagement of city garbage.
8. Neglect and mismanagement of putrid fish and other putrid organic matter.
9. Defective methods, and lack of protection of the atmosphere in various chemical processes, in which cyanogen, ammonia, sulphuretted, sulphide, and carburetted gases are evolved.

10. The manufacture and storage of super phosphoretted and ammoniated fertilizers.
11. The refining of petroleum, entire management, methods, utilization, and final disposal of the spent or "*sludge*" acid.
12. The manufacture of sulphuric and other acids.
13. Varnish and enamel factories.
14. Gelatine and glue factories.
15. The manufacture of salts of lead, tin and other metallic preparations.
16. Tanneries of special kinds.

State-Regulation and official Investigation of Effluvium Nuisances in other Countries.

IN FRANCE.—The Napoleonic Sanitary Code classified all sources of effluvium nuisances in the same manner as we have done upon the preceding pages, and for upward of fifty years the good results of exact regulation of causes of nuisances have been well recognized in Paris and other great cities of France. No less than one hundred and thirteen trades, occupations and kinds of storage are ranked under the French sanitary system, and in what we have here given as the first class, namely, that which requires regulation and inspection, but may be permitted within city limits and built-up towns, while of the second class, namely, that which requires strict regulation and some limitations as to the place in which they may be allowed to exist, there are 90 industrial occupations enumerated, and in what we have made our third class there are no less than 89, and these are sources of defilement of the atmosphere which cannot justifiably be permitted within or quite near to built-up cities and villages.

IN ENGLAND.—Inquiries extending through the period of forty years past have established the fact that certain numbers or kinds of sources of effluvium nuisance must be wholly excluded from cities and populous neighborhoods, and the same inquiries have also established the fact that by far the greater number of offensive businesses may, and should be rendered inoffensive, and that when capital shrewdly applies itself to preventing nuisances attendant upon particular trades, the profits that result from the prevention of the decay, disintegration, wastage and slovenly methods, the profits of the business so reformed as to being inoffensive, are enhanced, and that *capital so invested*. quite surely turns to profit.

In a search continuing through four years and ending a few months ago, the Local Government Board of Great Britain covered a very extensive series of investigations relating to some 70 kinds of offensive businesses which have for the past fifty years been continually accused as nuisances in that country. No less than 850 separate trade establishments were inspected and fully reported upon by Dr. Ballard, the chief of the National Sanitary Inspection of Effluvium Nuisances. Most of these were common trades, ranging all the way from soap-making, hair-cleaning, etc., to gas works.

In this inspection in England, by Dr. Edwin Ballard and his assistants, the following points were aimed at from the first:

"1. The extent and degree of the inconvenience to the community occasioned by industrial nuisances.

"2. The industrial processes, or the parts of industrial processes which produce effluvia complained of as offensive.

"3. The evidence that these offensive effluvia are also injurious to health.

"4. The methods which are in use, or may be devised, for preventing or minimizing nuisance from them.

"5. (Incidentally). The difficulties experienced by local authorities in dealing with this class of nuisances."

The tracing of offensive gases and emanations to their actual sources, though difficult, was well accomplished in the English investigation, and has been proved to be possible in regard to effluvia nuisances in the vicinity of the city of New York. The combination of several kinds of offensive gases and vapors which occurs in the Hunter's Point district and in the populous cities, naturally brings several sources of atmospheric defilement under one general accusation until those separate sources are separately traced. This is not always entirely practicable, because different businesses may nevertheless produce nuisances which closely resemble each other. Ammonia works and guano stores, for example, may have offensive odors that are chemically identical. The evidence of what each place and business contributes to the common nuisance often is to be obtained only by close inspection of the processes of the business itself.

EFFLUVIA THAT ARE INJURIOUS TO HEALTH.

It may justly be conceded from the start, in such inquiries, that persons who have become habituated to offensive odors may be found to be hardened and be rendered insensible to them, and, further, those who have suffered seriously from them have generally retired away from the business in which they were so exposed. Dr. Ballard, in his recent great study of the subject in England, soon reached the conclusions—

First.—That "it must be obvious that trade effluvia constitutes one item in the long list of circumstances which cause the air of a town to differ from country air."

Second.—That the unhealthful influence from effluvia may be simply from the effect of filth and its gaseous product; it may also be saturated with, and convey, infectious matter causing disease.

Third.—A stench may consist of chemical elements, or compounds, which, in addition to being offensive, are irritating,—sometimes poisonous—and generally injurious to life in proportion as they concentrate in any region or place. The acrid, irritating effect produced upon the surface of the body, respiratory and other mucous membranes, are among the definite evils complained of. The stench, independently of this effect, produce serious disturbance of health, and may act as poisons to the blood of those exposed to them.

Dr. Ballard reached the final conclusion, that notwithstanding that anyone of the effluvia nuisances may be highly injurious to health, it is found where the numerous sources of effluvia are combined, it is not possible to determine the extent or nature of the *share* which any one business has in the production of the total result from all. He also proves that by the application of "such knowledge as is now at hand, all, or nearly all, businesses which are now in a serious degree offensive, may be carried on either without offense, or with such important reduction of offense, as shall make it tolerable, or even trivial."

ACRID AND IRRITATING STENCHES.

The gases and effluvia which escape from sulphuric acid that is employed as a chemical purifier, or force, whether in liquid or in powder and semi-fluid materials yields some of the most irritating vapors and gases; and it will be found that this is now, or recently has been true in a marked degree in the vicinity of Hunter's Point. "Sludge acid" whenever it is exposed, and however it is used in the open air, is an example of this evil. Many of the businesses in which naphtha, the naphthous compounds, and the production and handling of the nitro-benzole compounds are carried on, are,—like the ammonia works and the exposure of "sludge acid" to the atmosphere,—traceable, with much certainty, to their sources. The destructive treatment of animal matters also yields effluvia that can be traced, in most instances, to their respective sources. The class-room experiment of placing upon separate plates the flesh or tissues of different animals, finely cut up, and then pouring on a small quantity of sulphuric acid, to answer the question, What animal is this odor from? is witnessed upon an enormous scale at the super-phosphate fertilizer works.

Will any Expert Inspection and Testing be Required?

The testimony which has already been well taken by the Municipal Boards of Health in the three cities that will be concerned in this investigation, now shows, that certain highly important questions relating to the identification and location of some of the persistent sources of effluvium nuisances have not yet been determined beyond all dispute or doubt. The testimony concerning some of these nuisances appears not yet to be satisfactorily exact and complete.

After the testimony of the petitioners and other complainants, together with that of a certain number of expert witnesses, has been obtained, it probably will be found that the State Board of Health must command for itself a certain kind of expert inspection, and certain expert testimony. What this service may need to be will appear after a considerable amount of testimony has been taken by this committee. The more comprehensive and exact this investigation by the committee is made, the more complete will be its public usefulness, and the more satisfactory it should, and must be, to all persons legitimately concerned in the offensive businesses that are to be under examination.

It will be found as true in New York as it has been in England and Scotland, as stated by the English government sanitary Commissioner Ballard, that "it is commonly found in practice to be as much to the interest of the manufacturers as of the public that the emanations from offensive processes should be thus arrested."

Facts concerning the success already attained in the mitigation and prevention of effluvium nuisances in the city and vicinity of New York in recent years.

When the Metropolitan Board of Health came into existence, in the spring of 1866, there were one hundred and seventy-three offensive slaughter-houses in the built-up parts of the city. Swine herds, swinepens, fat-rendering establishments, and in all, more than a thousand

very offensive sources of effluvia, detrimental to health, were found in the city, at the beginning of the summer of 1866. Even the neglect of manure dumps was then an insufferable source of nuisance. The several gas manufactories then purified their illuminating gas very imperfectly, so that sulphuretted hydrogen, sulphide of ammonium, and various poisonous compounds with the carburetted effluvia from those places polluted the atmosphere of the city.

The city garbage, and the dumps for street dirt were also insufferable nuisances. Some idea of the nature and extent of these nuisances, will be obtained by referring to pp. *xciii* to *xcvi* of Citizens Sanitary Survey of the city of New York, in 1865. Lime kilns, shell-burning, bone-black establishments, and numerous other grossly neglected industries, were offensively conducted. The ammonia liquor from the gas-houses, and any other purgent volatile materials were poured into the establishments wherever convenience dictated, while the sewers themselves from the many butcheries in the city became permanent sources of offensive effluvia, which have since been removed from nearly all the built-up districts of the city. The nuisances of the gas manufactories have been mostly overcome and prevented, and this has been accomplished by sanitary chemistry and engineering. The gas-houses still remain where they are, and they have more than doubled the amount of illuminating gas produced daily. The whole change for the better has been effected by chemistry and improved administration. The slaughtering of animals used for food has been so far removed from the central districts of the city, that whatever nuisances they now produce, are upon an infinitely reduced scale, as regards their extent and degree. The ammonia works have been removed from the city altogether, excepting in one of the water-side neighborhoods, where the proprietors claim to overcome all effluvia by their perfected apparatus, and improved factory administration. Whether this is so or not, may yet have to be proved.

Blood, offal, dead animals, fats of all kinds, have been brought under sanitary regulations, and they have diminished their offensiveness a thousand fold. The storage of offensive materials is now reasonably controlled, wherever there is such storage within the city of New York. Bone-boiling and the rendering of animal matters for fats continue to be offensive, but vastly less so than before the sanitary reform commenced fifteen years ago.

Nuisances that have new and aggravated sources of stench in the past ten years.

- (1.) The refining of petroleum, and the mismanagement of waste and volatile materials in that business.
- (2.) The increase of works for producing super-phosphates for fertilizers and other purposes.
- (3.) A vast increase in the quantity of coal consumed, thus liberating carburetted and sulphuretted gases in immense quantities.
- (4.) The general increase of manufactories that produce large quantities of wash and volatile matters, that add to the total amount of offensive effluvia in and near the city.

The greatest of all the causes of pungent and injurious effluvia that have thus been increasing year after year, and now are at their height,

are presumed to come from the refineries and chemical manufactories. The first class of these is represented by the exhalations incident to the exposure of sludge acid, and the volatile substances evolved in the refinement of petroleum. The second would comprise all offensive businesses that evolve ammoniacal, sulphuretted and carburetted phosphoretted gases and volatile vapors.

Sources of putrescence.

With the increase and the growing density of the population in and about the city of New York, a corresponding augmentation of waste and decaying organic matters (animal and vegetable) occurs. The gaseous and volatile effluvia from these materials are sources of great danger as well as offensiveness. To know, control and prevent these sources of nuisances has been one of the chief and most serious tasks of the sanitary authorities of New York and Brooklyn. To prevent the occurrence of accumulations and effluvia of waste and organic matters requires more rigorous sanitary law and regulations, and a larger amount of police interference than have hitherto been regarded as entirely practicable.

Suggestions to citizens who are aggrieved by the stench-nuisances that are said to originate from offensive businesses or other causes in the vicinity of Hunter's Point, Newtown creek, and the water-sides of New York, Brooklyn and Long Island city.—In any instance of specially distinguishable offensive odors which pollute the atmosphere at a particular time in a place, or over a district, that can at the time be described, let a record of the facts be made then and there, let the nature of the odors be described in plain terms, and at the earliest opportunity thereafter, and a copy of the facts may be given to this committee of the State Board of Health. If any opportunity occurs, and the facts should warrant it, there will be such an investigation made as should discover and verify the sources whence emanate the effluvia complained of.

In 1868-9 the Metropolitan Board of Health secured the suppression of great rendering, fat melting and bone boiling establishments, already had brought nearly two hundred slaughter-houses and their offensive accessories under regulation, and required that business to be carried on in regions north of the built up districts mostly above 40th street. The gas manufactories were all required to adopt the iron process of purification in addition to their other methods, and the gas liquor was regulated by restrictions that rendered it far less offensive than formerly.

In 1869 the manure-dump nuisances were diminished and so regulated (within the city) as to lessen and nearly terminate the complaints on account of them. In 1870 and 1871 they again were found in their old places defying the three Municipal Boards of Health that had superseded the Metropolitan Board.

The gas-house nuisances continued suppressed, with the exception of the exposure of the gas liquor or ammonia water.

The establishment of the ammonia works on Newtown creek created such a demand for this ammoniacal liquor, that it was no longer poured into the sewers of New York and Brooklyn. There had been for several years small ammonia factories near the gas-houses on the east and west sides of the city, now there is but one, namely, near the

foot of west 18th street. Great as have been the complaints concerning ammonia nuisances on the Newtown creek borders, they were vastly less than those requiring attention in the city of New York before this recent demand for the gas liquor was created.

Fat-boiling and the rendering of offal that at one time was driven away from the city, excepting on the very limited portion of the water-side:—

In 1873-74-75 the sanitary demands upon the sources of stench nuisances were urged with new success and resulted in a removal of nearly all of them beyond the limits of the city of New York, the fat-melting and manure dumps being the chief exceptions. The intensity and persistency of the effluvia that floated upon the atmosphere from the region of Hunter's point, west and north-west, and, in particular, conditions of the atmosphere, south-west also, causes complaining against them to be very widespread from the region of Canal street, for example, on the south, to 75th street on the north, and from East to the North river. Within those limits there dwell about 600,000 inhabitants. The entire area of Long Island City is invaded by the same vapors, and the extensive region of Brooklyn, E. D., during certain prevailing winds.

During the four years and upwards that the Metropolitan Board of Health was pressing its improvements, the nuisances in the Hunter's Point region were greatly reduced, as can be testified by Dr. Trask, the sanitary inspector of the Astoria and Hunter's Point district and by Dr. Bailey, inspector of the Newtown district. The withdrawal of the inspectorial surveillance after the relegation of the Metropolitan authority to the municipal government was followed by a rapid increase of the stench-nuisances, for neither the authorities at Hunter's Point or Long Island City, or those of Brooklyn successfully maintained the stringent regulations the Metropolitan Board had adopted. E. H.

B.

The Chemical Nature of Effluvia produced by certain Manufacturing Operations.

To the Special Committee of the State Board of Health:

The gases and vapors produced in manufacturing operations may be roughly classed as those exclusively of a mineral character, as chlorine from bleacheries, etc., and those of an organic character. Of course, according to the nature of the operations conducted, the two may be more or less commingled. It is with the latter class that we have here to deal. These organic (or more properly carbon) compounds, evolved from manufacturing operations may be divided into—

1. Those of an acid character which may be absorbed or fixed by bases, such as potash, soda, lime, etc. Sulphuretted hydrogen, sulpho-carbonic acid,* phosphoretted hydrogen, acetic acid and the like may be mentioned as examples.

2. Those of a basic character which may be absorbed and fixed by acids. These usually contain nitrogen (ammonia may be taken as the

*Sulpho-carbonic acid is the result of the unions of carbon disulphide with sulphuretted hydrogen, a compound being formed which affords a series of compounds with bases similar to carbonates with sulphur in the place of oxygen, Eg. K₂ CO₃ potassium carbonate, K₂ CS₃ potassium sulpho-carbonate. Carbon disulphide when pure has a rather pleasant ethereal odor, but as ordinarily delivered for manufacturing operations, contains other sulphur compounds of carbon, etc., of acid character (at least, which may be absorbed by bases, as potash and soda), which give the odor so well known to those who have to deal with it in any way.

type), and as examples of bases of this character, nicotine and conine may be mentioned. Some contain phosphorus forming the class known as phosphorines or phosphorus bases.

3. Those of a neutral character not fixed by acids or alkaline bases. Such may be hydro-carbons, as members of the paraffine, olefine or other series, oxygenated hydro-carbons, as compounds of the nature of alcohol and ether or sulphuretted *hydro-carbons* of corresponding constitution, etc.*

4. Besides these, with some kinds of material, organized germs or spores may be present in the gases, resulting from the decomposition of organic material, which exert a dangerous influence upon human health. These usually, though not necessarily, always are accompanied by gases or vapors belonging in the previous classes.

The emanations here chiefly to be considered are those arising from the manufacture of refined petroleum, of fertilizers and of the various products from bones. A brief statement of what, so far as known, the crude products contain, and the mode of manufacture, is here necessary.

Crude petroleum.—This consists chiefly of the series of hydro-carbons known as the paraffine series ($C_n H_{2n+2}$) of which marsh gas (CH_4) is the type. The first members are gaseous at ordinary temperatures, viz.: one or more the number of carbon atoms (and the hydrogen atoms correspondingly) increase in the molecule, give readily condensable gases, then liquids having boiling points higher and higher, until we reach forms solid at ordinary temperatures and known commercially as "paraffine."

In smaller proportion petroleum also contains some of the olefines, $C_n H_{2n}$, and probably at least three other compounds, viz.: one or more containing sulphur, one or more coloring matters, and one or more odoriferous compounds. The following table from Watt's Dictionary, IV, 385 (also III, 181) with the addition of the leading number of the series (found by Fouque) indicates what is known in this regard:

NAME.	Formula.	Boiling point. Fahren- heit.	Specific gravity.
Methyl hydride.....	$C H_4$	Gas.	.....
Ethyl hydride.....	$C_2 H_6$	Gas.	.....
Propyl, or Trityl hydride.....	$C_3 H_8$	Gas.	.....
Butyl, or Tetryl hydride.....	$C_4 H_{10}$	32° to 39°	0.600
Amyl, or Penty hydride.....	$C_5 H_{12}$	86°	0.628
Hexyl hydride.....	$C_6 H_{14}$	143°	0.669
Heptyl hydride.....	$C_7 H_{16}$	197½° to 201°	0.699
Octyl hydride....	$C_8 H_{18}$	241° to 244½°	0.726
Nonyl hydride.....	$C_9 H_{20}$	278° to 280½°	0.741
Decatyl hydride.....	$C_{10} H_{22}$	320° to 323½°	0.757
Udecatyl hydride.....	$C_{11} H_{24}$	356° to 363°	0.765
Dodecatyl hydride.....	$C_{12} H_{26}$	385° to 392°	0.776
Tridecatyl hydride.....	$C_{13} H_{28}$	421° to 424½°	0.792
Tetradecatyl hydride.....	$C_{14} H_{30}$	457° to 464°	.....
Pentadecatyl hydride.....	$C_{15} H_{32}$	491° to 500°	.....

* Paraffine series, $C_n H_{2n+2}$, type=Marsh Gas CH_4 . Olefine, series $C_n H_{2n}$, type=Olefant Gas $C_2 H_2$, etc. Alcohol $C_2 H_6 O$, ether $(C_2 H_5)_2 O$. Mercaptan $C_2 H_6 S$. Hydrosulphuric ether $(C_2 H_5)_2 S$.

The following olefines have also been detected by Warren:

NAME:	Formula.	Boiling point. Fahrenheit.
Decylene.....	$C_{10}H_{20}$	347°
Undecylene.....	$C_{11}H_{22}$	384½°
Dodecylene.....	$C_{12}H_{24}$	421°

The boiling points and specific gravities given are those observed by Pelouze and Cahours. The results of other observers vary slightly from these.*

Of course petroleum from different sources contains different proportions of these compounds. In some cases some may be entirely absent. Of those compounds existing in small amounts in petroleum we have at best very indefinite information, though no doubt some of them are partly responsible for the odors which render the neighborhood of petroleum refineries so objectionable.

The process of refining petroleum is conducted as follows: The oil is distilled in large retorts, the successive portions as they come over being kept separate. The products become heavier and heavier as the distillation progresses, and the process is controlled by tests made with a Beaumé hydrometer. The first distillate has a gravity of about 95° B. When the gravity attains 65° to 59° B., the stream of the distillate is turned into the burning oil tank, into which it is allowed to run until the gravity is about 38° B., when the stream is again diverted into the paraffine oil tank, the distillation being continued until an oily *coke* remains in the still.

The last portions have a gravity of about 25° B.

The products are usually in about the following proportions:

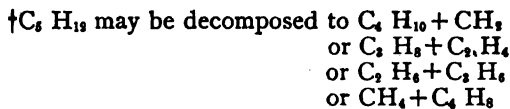
Naphtha, 15 to 20 per cent of the crude oil.

Burning oil, 55 to 65 per cent of the crude oil.

Paraffine oil, 20 per cent of the crude oil.

Coke, gas and loss, 5 to 15 per cent of the crude oil.

By slow distillation, the paraffine oils may be "cracked" into the lighter burning oils, and the yield of burning oil is increased with the destruction of the paraffine oils. The process results in the formation of olefines; for example



Some refiners distil by passing steam through the oil to remove the more volatile portions instead of applying the heat to the outside of the still, or a combination of the two modes of heating may be used.

The oils resulting from the distillation are "sweetened," as it is termed, by agitation in lead-lined tanks with one or two per cent of the strongest oil of vitriol of commerce (sulphuric acid) of 66° Beaumé,

*P. Schweitzer: *Lecture on Petroleum*; Columbia, Mo., 1879. Fouque: *Comptes Rendus*, LXVII, 1045. Ronalds: *Jour. Lond. Chem. Soc.*, XVIII, 64, 529. Pelouze and Cahours: *Comptes Rendus*, LIV, 124; LVI, 506; LVII, 63; *Ann. Ch. Phys.* [4] I, 5; *Ann. Ch. Pharm.*, CXXIV, 289; CXXVII, 196; CXXIX, 87. Schorlemmer: *Chem. News*, XI, 256. Warren: *Am. Jour. Sci.* [2] XL, 89, 216, 384 and XLV, 322. Warren and Storer: *Mem. Am. Acad. Sci. New. Ser.* XI, 206.

†Watt's Dictionary, 2d Supp., p. 892.

Thorpe and Young: *Jour. Lond. Chem. Soc.* [2] IX 342, X, 802.

containing 93 to 95 per cent of acid. The acid carbonizes some of the impurities (in the same way in which it acts upon sugar), and also by forming chemical compounds or by mechanical adherence, carries out the impurities (odoriferous and other) which contaminate the product. The acid on settling to the bottom is drawn off and known as sludge. The oils are again agitated with alkali to remove the last traces of acid, and are thus ready for the market.

The refuse products are, the cokings, naphtha and the sludge.

The cokings or "still-bottoms," as they are sometimes termed, often possess a strong and unpleasant odor, but as the operation of distilling has removed the most volatile portions of the oil, the odor does not extend very far. These cokings are usually burned under the stills or boilers. The naphtha contains many of the light hydro-carbons, together with a considerable proportion of the compound referred to as giving the distinctive odor to the petroleum. The sludge contains carbonized tarry matters, and a compound of volatile nature and penetrating odor, the composition of which is at present unknown. It seems possible that it may be some compound or modification of the substance referred to as giving the characteristic odor to the petroleum.

The investigation of this substance is attended with great difficulty, on account of its volatile and penetrating qualities. With most persons the fumes produce dizziness, severe headache, and even vomiting. In my own case the headache resembled that produced by exposure to nitroglycerine so far as I recollect. In one case that came to my knowledge, nausea, sufficient to prevent the retention of any thing on the stomach for some little time, was also produced.

In distillations conducted on sludge oil by Mr. A. L. Colby, a student of the School of Mines, the major part of this compound (determined by the odor of the distillate) came off at temperatures below 320° F. In my own experiments small amounts were obtained at temperatures below 212°, it probably, therefore, volatilizes at temperatures in the neighborhood of 212°. The odor is *indescribable*, but has something of a garlic quality about it, which would imply the possible presence of a sulphuretted compound. A rough test on the unpurified distillate indicated the presence of a small amount of sulphur, but whether as an impurity or as a constituent, it is impossible to say. The compound is evidently of the neutral class of substances, since it is not absorbed or neutralized by either acids or alkalis.

Strong oxidizing agents, as chlorine, etc., appear to have some effect in altering its constitution and converting it or some of its constituents (for it may be a mixture and not a definite compound) into compounds having a rather pleasant aromatic odor. I am inclined to suspect that it may be allyl C_8H_{11} , or some compound of that series or its derivatives (sulphur or oxygen compounds), but further investigation is necessary to decide more definitely upon its constitution and character. Such an investigation would be of great value, both from the point of view of the sanitarian and of the manufacturer. In this connection I desire to quote from Dr. Ballard's report on effluvium nuisances, Sixth Annual Report of Local Government Board, 1876-1877, England, p. 125. "The use of due means to prevent effluvium nuisances in industrial establishments of all kinds often turns out to be in a variety of ways, direct or indirect, and often unforeseen, conducive to prosperity. This is a fact which those

most largely engaged in many of the most offensive businesses now recognize more or less completely."

The Tunyoap resin manufacture, U. S. patent 178,061, the recovery of pure sulphuric acid from sludge, and the superphosphate manufacture, would all be benefited by a knowledge of the nature and constitution of this substance.

2d and 3d. Fertilizer, manufacture and bone working.—As these deal with substances of animal origin, they necessarily go together, since for them, the major part of the raw material consists of substances from that source.

Animal matters may be roughly classed under (a), bones; (b), fat; (c), flesh, blood, nervous tissue, etc.

Bones.—About one-third of the weight of bones are organic substance (Berzelius), *i. e.*, combinations of carbon, hydrogen, nitrogen, etc.

The principal constituents of this animal matter are nitrogenous compounds, as gelatine, etc., fats or oxygenated hydro-carbons. Some phosphoretted and sulphuretted compounds also probably exist in them.

Crude fats contain the fatty acids combined with glycerine, and the membrane inclosing the fat, during the life of the animal, which contain nitrogenous compounds.

Flesh, blood, etc., contain substances built of atoms of carbon, hydrogen, nitrogen and sulphur, and in some cases phosphorus.

The products of the decomposition of bones by the slow and natural process of decomposition have not, so far as I am aware, been studied. They are no doubt similar in many respects to those obtained in the operations of manufacturing bone black and ammonia salts from bones. The composition of bone tar (Dippel's oil) was made the subject of an elaborate investigation by Prof. Anderson in 1848 to 1854,* and by his labors several compounds were isolated and identified.

These were:

Acids.—Carbonic, CO_2 ; hydro-cyanic or prussic, HCN ; hydro-sulphuric (sulphuretted hydrogen), H_2S ; an acid oil consisting of a mixture not separated.

*Trans. Roy. Soc., Edinb., XVI, pt. 4, Apr. 1848, XX, pt. 2, Apr. 1851, XXI, pt. 1, Apr. 1854.

	Formula.	Boiling point. Fahrenheit.	Specific gravity.	Properties and remarks.
<i>Bases:</i>				
Methylamine	$\text{CH}_5 \text{ N.}$	Gas.....	.....	Strong ammoniacal odor; pungent
Ethylamine	$\text{C}_2 \text{ H}_7 \text{ N.}$	$75\frac{1}{2}^\circ$	0.696	Ammoniacal and putrid odor.
Propylamine	$\text{C}_3 \text{ H}_9 \text{ N.}$	150°	Strong pungent odor.
Butylamine	$\text{C}_4 \text{ H}_{11} \text{ N.}$	175°	Very volatile; pungent odor.
Amylamine	$\text{C}_5 \text{ H}_{13} \text{ N.}$	201°	0.750	
Pyridine	$\text{C}_5 \text{ H}_5 \text{ N.}$	240°	0.986	Odor more pungent than picoline.
Aniline	$\text{C}_6 \text{ H}_7 \text{ N.}$	360°	1.020	Oily; vinous odor.
Picoline.	$\text{C}_6 \text{ H}_7 \text{ N.}$	275°	0.961	"Odorine" of Unverdorben; overpowering odor.
Lutidine	$\text{C}_7 \text{ H}_9 \text{ N.}$	326°	0.946	Pungent aromatic odor.
Collidine	$\text{C}_8 \text{ H}_{11} \text{ N.}$	354°	Aromatic odor.
Pyrol bases.....	.....	212° to 370°	Odor disgusting; major part distilled 280° – 310° .
<i>Neutral substances:</i>				
Benzol.....	$\text{C}_6 \text{ H}_6$	$176\frac{1}{2}^\circ$..	0.85	Odor pleasant
Homologues of benzol				
Pyrol.....	$\text{C}_4 \text{ H}_8 \text{ N.}$	133°	1.077	
Alcohol radicals — Ni-				
trogenous compounds				
of fatty acids....	.....	.....	.....	Decomposed by sodium.

All the bases emitted their peculiar odor at ordinary temperatures, although many of them have high boiling points.

Although, according to Dr. Anderson, but three-quarters of one per cent of the Dippel oil consisted of bases, yet these bases, on account of their volatility, give the chief character to the oil so far as odor is concerned. Possibly none of these bases, may be produced when bones are otherwise treated or are allowed to decompose, but undoubtedly, compounds similar in character and in general properties, will form.

Composition of Fats, and products of their decomposition.

As already stated, fats consist of fatty acids combined with glycerine. The following are some of the most important fatty acids :

NAME.	Formula.	Boiling point.	Odor.
Butyric	$C_4 H_8 O_2$	.....	Rancid.
Valeric	$C_5 H_{10} O_2$	347°	Strong; unpleasant.
Caproic	$C_6 H_{12} O_2$	392°	Sudorific.
Caprylic	$C_8 H_{16} O_2$	448° to 451°	Feeble; unpleasant.
Capric	$C_{10} H_{20} O_2$	.....
Palmitic	$C_{16} H_{32} O_2$	.....
Oleic	$C_{18} H_{34} O_2$	.....
Stearic	$C_{18} H_{36} O_2$	.....

- Glycerine has the formula $C_3 H_8 O_3$.

The fatty acids are freed from their combinations with glycerine by heat and pressure combined (the process pursued by soap boilers), or by the fermentation induced by the action of the inclosing membrane. This fermentation also will cause decomposition of the palmitic, oleic and stearic acids into the more volatile fatty acids. The nitrogen in the inclosing membrane by this fermentation also affords ammonia; and the application of heat at this stage gives rise to the formation of amides which are, mostly, neutral nitrogenous substances.

The odorous products of the decomposition of crude fat may be tabulated as below, though the list is no doubt far from being complete.

Acid substances.—Carbonic, acrylic, butyric and other volatile fatty acids.

Bases.—Ammonia.

Neutral substances.—Caprylene $C_8 H_{16}$, and other olefines. Acrolein $C_3 H_4 O$, boiling at 126 1-2°. The latter compound is produced in the destructive distillation of fats or glycerine, and has an intensely irritating odor.

Flesh, blood, nervous tissue, etc., contain many highly complex compounds, some containing only nitrogen beside carbon, hydrogen and oxygen, others containing sulphur or phosphorus in addition. Very few of these compounds have received any definite formulæ.

Of those containing nitrogen—gelatin may be taken as an example; and containing sulphur also are the proteids—such as albumen, casein,

etc., and containing phosphorus, is nerve-matter, etc. The proteids contain: Carbon—52.7 to 54.5 per cent. Hydrogen—6.9 to 7.3 per cent. Nitrogen—15.4 to 16.5 per cent. Oxygen—20.9 to 23.5 per cent. Sulphur—0.8 to 1.6 per cent.

When fresh, these compounds are usually free from unpleasant odor, but being of a highly complex character, they readily decompose by natural or artificial processes into other compounds, many of which are of an extremely nauseous or otherwise objectionable character.

The nitrogen may afford ammonia or bases of the general characteristics of those described under the decomposition products of bones.

The sulphur may give acids of the character of sulphuretted hydrogen or sulpho-carbonic acid, possibly some sulphur bases, and sulphur alcohols and ethers, mercaptans, etc.

The phosphorus may give phosphoretted hydrogen or phosphorus bases (phosphines).

Manufacture of Fertilizers.

The raw material may be generally described as chiefly refuse matter of all kinds which may contain nitrogen or phosphoric acid. More specifically we may mention: Dried and refuse blood and blood-clot from the manufacture of blood albumen; "Tankage" (called in England "greaves"), the refuse material from which the fat has been extracted by boiling and pressing by the fat-boilers; bone-refuse from bone-boilers, glue-makers, bone-workers, retail butcher shops, etc., bone-black dust from bone-burners, or exhausted black from sugar refineries; tendons, hoof and horn clippings, etc., after the glue and size have been extracted ("Scutch"); hide scrapings and trimmings from tanneries; leather scraps; hair fit for no other purpose; slaughter-house refuse, bones, fat and meat; fish refuse from the drying and curing of fish, extracting the oil, etc.; sugar scums from sugar refineries, rocks from mineral deposits containing phosphate of lime (South Carolina phosphate rock, etc.); sulphuric acid or sludge acid in its place. For some special purposes, crude sulphate of ammonia, or chloride or sulphate of potassium may be employed.

Mode of manufacture.—The object of the manufacturer is to produce a material which shall contain certain percentages of soluble superphosphate of lime, and of nitrogenous substance which, by decomposition, will afford ammoniacal compounds. The usual proportions in the fertilizers made are, ten per cent soluble phosphoric acid, with about one to three per cent phosphoric acid not converted to soluble form, and two to three per cent of ammonia with 10 to 20 per cent of moisture. The materials (except the sulphuric acid) are mixed together according to what is on hand, and the quality of the product desired, and after thorough mixing the sulphuric acid is poured over the mass and stirred in, either by hand or by machinery.

The sulphuric acid is usually of the kind known as "chamber acid," *i. e.*, such as is taken from the sulphuric acid chambers in which it is made, without concentration, having a gravity of about 50° Beaumé, and containing 60 per cent or over of pure acid. Where sludge acid is used, the sludge from the petroleum refineries is too strong, and is therefore diluted with about one-fourth its bulk of water, the tar or sludge oil is allowed to separate, and the acid, thus diluted, is used.

The proportion of acid to the other material is usually about one-half by weight. Thus a charge for hand-mixing will consist of about 200 lbs. of material to 100 or 120 lbs. of acid.

After mixing, the charge is turned out and spread to dry for a few days, when it is ready for shipment. Sulphuric acid of the above degrees of concentration, as is well known, evolves much heat on mixing with water, so that the dilution of the sludge when that is used, or the addition of the acid in either the pure or impure form to the material (which always contains more or less moisture), produces a considerable rise in temperature, which will volatilize the compounds already present or formed by the action of the sulphuric acid upon the constituents of the charge, which can assume the gaseous form at such temperatures.* The basic constituents of the charge, by their union with the sulphuric acid, also aid in the rise in temperature.

With fresh materials and fresh acid, the escaping vapors have a strong odor of sulphurous acid and a somewhat unpleasant organic odor, which, however, diffuses rapidly, and does not extend far from the mixing tub. With material which has been kept until decomposition has begun, the vapors may contain, besides the above, sulphuretted hydrogen, volatile fatty acids, and some products similar or identical with those acid or neutral compounds mentioned, as resulting from the decomposition of bones, fat and animal matters. Such odoriferous compounds, especially the fatty acids, and some of the organic sulphur compounds may be perceived at some distance, perhaps half a mile or more, depending on the state of the atmosphere.

When sludge acid is used the odor is more intensely disagreeable, since to these organic products is also super-added that of the compound or compounds referred to as existing in the sludge. This odor will extend to great distances, *at least five miles, if atmospheric conditions favor; and possibly farther.* The sludge compound seems to carry with it some of the organic compounds alluded to, and, even at a considerable distance the odor of the nauseous organic compounds, as well as the sludge odor, may be detected.

Bone-boiling.—The raw material has already been described. The material is often allowed to lie in heaps until more or less putrefaction has taken place before it can be treated.

The mode of treatment is by covering the bones with water, and applying heat either by firing below, or by passing in steam. In a few hours the fat has been extracted and the boiling is interrupted to allow it to rise to the surface, when it is skimmed off. The boiling is then resumed and continued uninterruptedly for some days in order to extract the gelatine. The liquor is then run off and evaporated down to a proper consistency, when it is allowed to cool to a jelly, which is cut up and dried on net-work stretched on frames.

The bones are allowed to dry, after which those of suitable size and quality are usually picked out and sent to the bone-workers, the others, together with the chippings from the bone-working, being used to manufacture bone-black.

At each step in the process, including the drying of the bones, if

*Dr. E. Ballard (8th Report of Local Gov't Board, London, 1876-77, p. 255) states that the temperature of a charge three or four minutes after mixing the charge was found to be 240° F. A heap three or four days after leaving the mixer had a temperature of over 210°, and another heap, which had been cooled by a fan for 16 hours, showed 180°

proper care be not exercised, the ill-smelling compounds referred to under the head of Decomposition — products of bones and of crude fats may be evolved, such as nitrogenous bases and volatile fatty acids, together with organic sulphuretted compounds in some cases.

Bone-burning.— The burning is effected in large pots set in a furnace (which is said to yield the best product) or in retorts resembling those used for gas when it is desired to save the bone-tar and ammonia-salts resulting from the distillation. After the burning is completed the black is broken up, screened and sent to the sugar refineries, etc.

When the burning is effected in pots, the major part, or all of the volatile products of decomposition, are burned in the furnace. When, however the burning in pots is mis-managed, or the products of decomposition are attempted to be saved, and are not properly condensed, the substances mentioned by Anderson as existing in the bone-tar may escape into the atmosphere, giving a pungent and persistent odor, which may be perceived at considerable distances.

Chemical nature of effluvia produced by certain manufacturing operations.

To sum up, then, the nuisance caused by petroleum refining, may result from —

I. Distilling off the lighter portions of the petroleum or their subsequent treatment, affording:—naphtha vapors, light hydro-carbons; the substance referred to as giving the distinctive odor to petroleum.

II. Treatment of the distillates with steam or with sulphuric acid, affording:— the volatile compound or compounds referred to as existing in sludge as well as the above.

III. Cleaning the stills by steam, affording the same as I (above).

The nuisances caused by fertilizer manufacture are —

1. Heaps of decomposing material, affording:— sulphuretted compounds, volatile fatty acids, nitrogen bases, etc.

2. Diluting sludge, affording:— the volatile compound or compounds referred to as existing in sludge.

3. Mixing sludge acid with the organic material; and:

4. Cooling, drying and storing the fertilizers, affording:— the above, together with acid and neutral compounds mentioned as resulting from the decomposition of animal matters.*

The nuisances caused by bone-boiling are —

1. Heaps of decomposing material, affording:— essentially the same products alluded to under fertilizer manufacture under the same circumstances.

2. Boiling for fat, affording:— volatile fatty acids and the products of the decomposition of fats mentioned, as well as nitrogen bases.

3. Boiling for glue, affording:— essentially the same as the above, the nitrogen bases predominating.

4. Drying the bones, affording:—pungent nitrogen bases.

The nuisance caused by bone-burning affords compounds mentioned in the table of substances obtained from bone-tar.

Of all the compounds described or indicated, that from sludge, the nitrogen bases and the volatile fatty acids, appear to travel the furthest without diffusion, and therefore, to be perceptible at the greatest distances

* To this may be added hydrofluoric acid when (as is sometimes the case) a phosphate rock containing fluoride is used. This compound is usually more of a source of annoyance to the workmen than to the neighborhood.

in about the order named. A subject worthy of attention in this connection is the question as to the power of certain volatile compounds to carry certain others with them to considerable distances. Ammonia and carbonic acid are believed to have this property. It is confidently asserted by some concerned in the manufacture of illuminating gas, that naphthaline (a heavy hydro-carbon, solid at ordinary temperatures) will be retained by the gas unless the ammonia is removed, and that as soon as the ammonia is taken out it condenses. Several facts observed seem to substantiate this view. If it be true, the principle no doubt holds good for compounds other than naphthaline, and possibly for others than ammonia, and has an important bearing on the subject of effluvia nuisances. In conclusion, we remark that the compounds causing the stench most complained of from manufacturing operations, of this class, have extremely complex chemical characteristics. Many of them are remarkable for retaining their offensive qualities, even when borne considerable distances through the air.

Respectfully submitted,

ELWYN WALLER, Ph. D.

SCHOOL OF MINES, COLUMBIA COLLEGE,
NEW YORK, April, 1881.

[C.]

*Abstract of Inspector Colby's notes on Offensive Trades in the vicinity of
Newtown Creek and Hunter's Point.*

To Dr. J. SAVAGE DELAVAN,

Chairman of Committee on Effluvia Nuisances:

In answer to instructions received from your committee, I have the honor to submit the following report on the offensive trades at Hunter's Point, Newtown creek and vicinity. The district comprised in this report has been for years the subject of much complaint by the citizens of New York city, and partial but temporary relief has been secured by the efforts of their local Board of Health.

The exact parts of Queens and Kings counties comprised in this report are Long Island city, as far north as 13th street (which includes Hunter's Point), both sides of Newtown creek as far up as Penny Bridge (which includes Blissville), the shore lines of Greenpoint, of Bushwick Inlet, of Williamsburg, as far south as north 9th street. The importance and extent of this evil may be clearly seen by reference to the accompanying map, which shows that this extensive district lies directly opposite that part of New York city bounded by Grand street on the south and 42nd street on the north. Hence, offensive effluvia arising from separate industries along this extensive shore line, and combining in the upper strata of the atmosphere, are easily wafted by east, south-east or north-east breezes, directly over a wide and central band of the city of New York, including our best city residences, as well as our most popular tenement house districts.

This region has been occasionally and irregularly visited from October 4th to December 21st.



During these inspections information has been sought on the following points:

1. The causes in the various trades that give rise to the offensive effluvia complained of.
2. The chemical nature of these effluvia.
3. The methods taken, if any, by the manufacturers to prevent or lessen their production of nuisances.
4. The degree of compliance with the Governor's proclamation by those engaged in the offensive trades mentioned therein.

This division of offensive trades mentioned in the Governor's proclamation, will be used in this report to classify the information obtained on the above questions.

PETROLEUM REFINING.

This industry, the most extensive in the district, deserves a somewhat detailed consideration.

The objectionable features will be referred to, noting the steps in the process of refining in their order.

Fractional distillation of Petroleum.—This operation is conducted in large cylindrical retorts or "stills," connected with a coil of wrought iron pipe, submerged in a tank of water for the purpose of cooling. The first products of distillation are gases; at ordinary temperature they pass through the coils and escape without being condensed. The vapors soon begin to condense and the first distillate obtained has a gravity of about 95° Beaumé. As the distillation proceeds the products become heavier and when the gravity reaches 65° to 59° Beaumé, the stream of *distillate* is turned into the "burning oil" tank into which it is allowed to run until the gravity is about 38° Beaumé, when the stream is diverted into the "paraffine oil" tank, the distillation being continued until only tar remains.

Products of the Fractional Distillation of Crude Petroleum.

NAMES.	Limits of Gravity Beaumé.	Average Gravity Beaumé.	Specific Gravity	Boiling Point.	Average yield of Pa. oil of 45° Beaumé.
1. Gases, uncondensed.	.....	.....	.....	.....	.....
2. Cymogene.....	115 to 105 deg	110 deg	.600	32 deg F.	.....
3. Rhigolene.....	105 " 95 "	100 "	.625	65 "	.....
4. Gasolene.....	95 " 80 "	87 "	.664	120 "	1.5 per ct.
5. Naphtha (refined)....	80 " 65 "	73 "	.700	175 "	10.0 "
6. Benzine.....	65 " 60 "	63 "	.750	250 "	4.0 "
7. Kerosene, burning oil.	60 " 38 "	46 "	.807	340 "	55.0 "
8. Lubricating oil (com'n)	38 " 25 "	30 "	.885	885 "	17.5 "
9. Paraffine.....	.....	.....	.....	.....	2.0 "
10. Coke.....	.....	.....	.....	.....	10.0**

* This figure includes the uncondensed gases at ordinary temperature (Nos. 1, 2 and 3), the tar, and loss.

In actual practice one refinery does not make the entire list of *distillates*, but disposes of crude distillate to others for purification.

Odor of uncondensed vapors.—The escape of the light hydrocarbons produced during the first part of the distillation is *now* prevented by a simple system of hoods and suction conduits, which lead the gases

from each still down into its own fire, thereby burning them without offense.

Odor of crude distillate.—This is produced by exposure, in tanks with the covers open, in order to receive the benefit of sun-light and wind in bleaching and purifying the oil. The source of evil is entirely unnecessary.

Odor in cleaning Stills.—This operation was a source of nuisance; after the last distillate has run off into the "heavy oil-tank," there yet remains in the still tar and some soft coke. The tar is first drawn off into closed tanks, and subsequently mixed with coal-dust for fuel. The still is then cleansed of remaining vapors by blowing in steam, as it is termed. This steam, with offensive vapors, was until recently allowed to escape into the air. But, by the same effectual method used in consuming the uncondensed gases, these offensive gases are now completely consumed, thereby removing a large factor in the combined nuisance of an oil refinery, as well as materially saving in the consumption of fuel.

Production of Smoke.—Improvement has been made in the abatement of this source of nuisance. In most of the refineries, the fires are started with wood and broken coal, and no "mixed-fuel" (consisting of pea coal, dust and other refuse tar, and coke from the stills) is used until the fire is perfectly lighted. There are some refineries, however, in which this important matter is grossly neglected, and defective "stoking" renders, in all the refineries, the frequent or occasional production of an immense volume of smoke, which could be prevented by more careful superintendence of the stokers.

Treatment of the Distillate—Agitation with Sulphuric Acid.

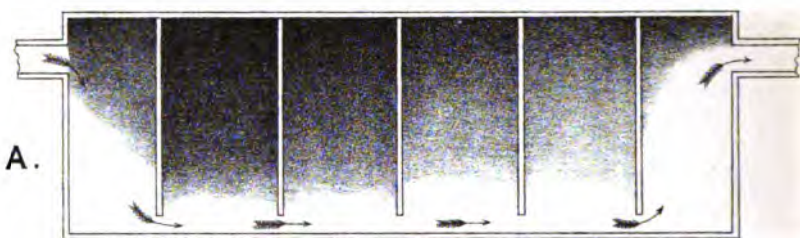
The crude distillate (as well as naphtha and lubricating oil) resulting from the fractional distillation as described, is next purified or "sweetened" by thorough agitation in cylindrical lead-lined tanks or upright "agitators" with from 1 to 2 per cent, by measure, of the sulphuric acid of 66° Beaumé. The agitation is effected by blowing air through the liquid by means of a pipe extending nearly to the bottom of the tank. By this means the acid removes the offensive properties of the distillate, partially by carbonization as well as by chemical combination; and also, by virtue of its gravity. The impurities thus removed are—

1. The offensive characteristic odor of the crude distillate.
2. The tarry and gummy matters which would render the oil useless by the rapid incrustation of the lamp wicks.
3. The color, disagreeable to the eye.

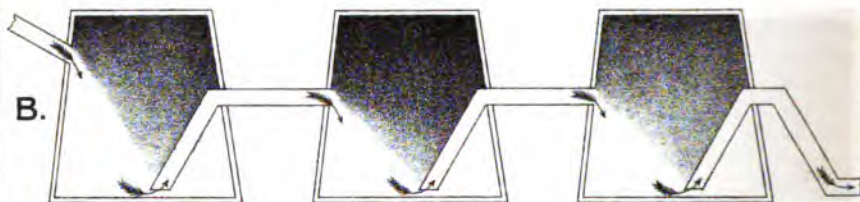
After this thorough agitation, on standing, there separates a dark red, tarry liquid which is drawn off from the cone-shaped *base* of the agitators. This constitutes the well known "sludge" or "spent acid," as it is termed by the refiners. The oil is then washed with water; then with an alkali (usually caustic soda) thus neutralizing all remaining acid, and leaving the oil "sweet" and colorless, ready for the market.*

Exposure of Sludge-Acid.—The effect of improper manipulation of this offensive product has been a great nuisance. In this important matter eleven of the thirteen refiners have united in adopting a system

*Some refiners wash the oil again with water after treatment with alkali, and occasionally redistillation or exposure under glass to the sun is resorted to.

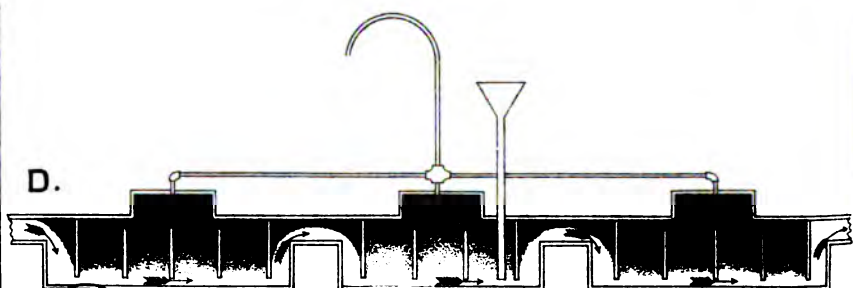
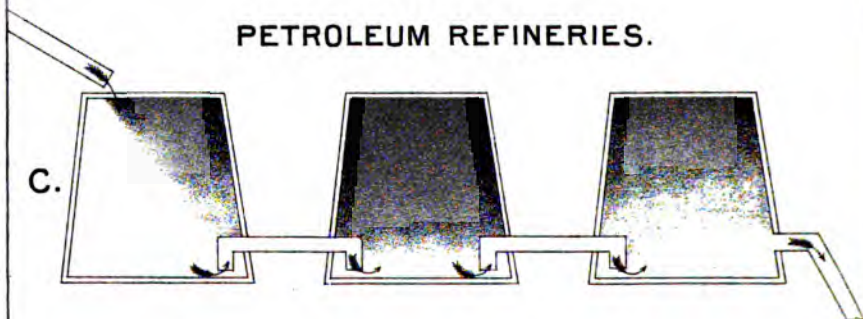


DIFFERENT FORMS OF TRAPS



USED IN

PETROLEUM REFINERIES.



of improvement by which from the time the sludge-acid is made in the agitator until it reaches Barren Island (during the winter) and the ocean (during summer) it is not in any way exposed to the atmosphere. The importance of this improvement warrants the explanation of the mode of accomplishing the result. The "sludge" is drawn from the agitator, as soon as it has settled out of the oil, into a small *pressure-tank*; from there it is forced into the covered *storage-tank*, at or near the dock of each refinery. Two sealed tank-boats under control of Chas. Pratt & Co., one of the 11 guarantors, are used in conveying the "sludge" from the refineries away from the cities. To prevent escape of gases, in filling the boats from the storage tanks, a large pipe runs from the top of the tanks on the boats down four feet in the water, so that the gases forced out by the filling of the tanks are absorbed.

Waste of Oil in Wash-water.—The refiners have found it to their advantage to hold, by a system of traps, all wash-waters from the agitators and even the soakage-water of their premises. Several forms of traps are used in the refineries for this purpose, all having for their object the retention of the water in order that the oil may thoroughly separate from it and be syphoned off for retreatment. The accompanying drawings show in section the different styles of traps used.

In conclusion, it is seen that the centralized action on the part of the refineries to comply with the Governor's proclamation, has resulted in the suppression of a nuisance in almost every step of the process of refining.

MANUFACTURE OF SUPERPHOSPHATE FERTILIZERS AND THE STORAGE OF MATERIALS.

In the stench-district there are three fertilizer factories and three store-houses.

In the manufacture of the fertilizers made at these factories, the following raw materials were found on the premises:

1. Phosphatic rock (from South Carolina and elsewhere).
2. Kainit (chloride of potash).
3. Nitre (nitrate of potash).
4. English phosphatic fertilizer (prepared).
5. Guano (Peruvian and other).
6. Cotton-seed meal (after oil has been pressed out).
7. "Tankage" (the refuse material from which the fat has been rendered by boiling and pressing).
8. Bone-refuse (from the bone-boilers, glue makers, bone workers, retail butcher-shops, etc).
9. Bone-black dust (from bone-burners or exhausted "black" from sugar refineries).
10. Sugar-scum (from sugar refineries).
11. Dried and refuse blood and blood-clot (from the manufacture of blood albumen).
12. "Scutch" (the tendons and hoof and horn clippings, etc., after glue and size have been extracted).
13. Hide scrapings and trimmings (from tanneries).
14. Leather scraps.
15. Hair, fit for no other purpose.
16. Fish-scrap, dried fish and fish bones (from the drying and curing of fish, extracting the oil, etc).

17. Dried meat.

18. Slaughter-house refuse, bones, fat and meat.

Certain of these raw materials, depending upon the kind and quality of product desired, are thoroughly mixed, ground and screened, then treated with "chamber acid" (sulphuric acid of 50° Beaumé) in the proportion of about 12-10 parts of acid, to 2 parts of material. The mixture is spread out to dry, ground up with other constituents, and the fertilizer is ready for shipment.

The mixing with acid evolves much heat which serves to volatilize the compounds, and the effluvia produced and set free by the reaction.

Manipulation of "Sludge Acid."—Recovery of Sulphuric Acid.

This offensive operation for recovering sulphuric acid from the "sludge" is still carried on at one establishment on the Brooklyn bank of Newtown creek near Blissville Bridge, and in direct opposition to the Governor's proclamation. [This nuisance was suppressed immediately after this report, and the proprietor was tried, convicted and fined by Judge Fisher of the Brooklyn City Court. E. H., *Secretary*.]

The manipulation of sludge acid gives rise to such ill-smelling and penetrating stench, under favoring conditions of the atmosphere that they may extend several miles.

Fat-boiling.

The offensive process of melting and boiling refuse fat and scraps for the production of tallow, which gives rise to disgusting effluvia, contributes an important share to the general nuisance of the immediate neighborhood.

During the process of boiling the complex effluvia generated consist of volatile fatty acids, nitrogen and sulphur-compound, offensive neutral and acid substances, and when decomposing and putrefying material is used, which is often the case, to this are added the odious sulphuretted, nitrogenized and other gases resulting from the complex decomposition of animal matters.

Boiling and burning of bones.

This branch of industry is carried on at the Preston Fertilizing Company (formerly H. T. Preston's Sons), Queens county, Newtown creek, Blissville. The mode of treatment is as follows: first, boiling the bones. The bones are boiled with water for some time in covered tanks, having flues attached which lead the gases into the fire. The fat is then skimmed off and the boiling kept up for the extraction of the gelatine. The bones are then dried and sorted, the best being made into knife handles and the others into bone black. Second, burning of the bones. This is effected in covered pots which are set in long, low furnaces; when completed the black is broken up, ground, screened, and sent to sugar refineries, etc. The dust is used by fertilizer factories.

As now conducted at these works the objectionable features of the industry are greatly done away with. Constant care, however, needs to be exercised in both boiling and burning of the bones, to prevent the escape of offensive effluvia of the same chemical nature as those mentioned under the head of Fat-boiling. The storage of decomposed animal matter should be also discontinued.

MANUFACTURE OF PRINTING INK.

In the district there are two ink factories. The offensive part of the process consists in the boiling of the raw linseed oil, which has to be conducted with great care and at carefully regulated temperatures. Oxygen is absorbed with the consequent elimination of carbon and hydrogen, partly as carbonic acid and water, but also with the production of volatile hydrocarbons analogous to acroleine, which are very offensive and penetrating in their effects.

The production of lamp black at Wilson's factory is also a local cause of complaint, as by careless management much smoke is produced. No means are taken by either of these manufacturers to prevent the escape of the obnoxious vapors produced in the boiling of the oil.

MANUFACTURE OF PARAFFINE AND LUBRICATING OILS.

This industry may be conducted with little or no production of offensive effluvia. Proper regulations in the matter of stoking and undue exposure of distillate is however necessary. In the treatment of the heavy oils of petroleum with sulphuric acid the compound, corresponding to sludge acid in the kerosene manufacture, is without odor.

MANUFACTURE OF VARNISH.

This industry is extensively carried on in the district. This may be best shown by enumerating the ten factories devoted to this industry.

Fixed oil, volatile oil, and spirit varnishes are here manufactured, also; and the *resins* employed are gums, copal, shellac, sandarac, mastic, amine, damar, Canada balsam, etc. The *solvents* employed are linseed and other drying oils, oil of turpentine, spirits of wine, wood spirits (methyl alcohol), etc.

Boiling linseed oil.—This is accomplished in open copper vessels, with addition of oxidizing substances, such as oxide of zinc, peroxide of manganese, etc., by which means the linoleine of the oil is oxidized into the tough elastic substance linoline, and giving rise to the penetrating gases.

MANUFACTURE OF AMMONIA AND ITS SALTS.

This trade, causing, as it did, the dissemination of very offensive odors, is now happily dropped from the list of producers of offensive effluvia from this aggrieved district. The Standard Chemical Co., (formally Standard Ammonia Co.), East avenue and First street, Long Island City, which were formerly engaged in the manufacture of aqua-ammonia, sulphate of ammonia, and nitrate of ammonia, thus creating by bad drainage and defective mechanical apparatus, nuisances greatly complained of, have now entirely stopped this branch of their business, and are at present only engaged in the manufacture of "chamber acid" (sulphuric acid of fifty degrees Beaumé), for the use of fertilizer factories.

MANUFACTURE OF CREAM OF TARTAR.

This industry is carried on at the "French Cream of Tartar Co.'s," works, Kings county, corner West and Greenpoint avenues, Brooklyn; and also at the factory on Greenpoint avenue, Blissville.

The process at the French Cream of Tartar Co. consists simply in making a hot water solution of the cream of tartar contained in the crude argols; purification of this solution with pipe clay, and subsequent crystallization and thorough washing of the resulting crystals of cream of tartar obtained. At the Blissville factory the operation is one of precipitation of the cream of tartar as a fine powder, instead of its crystallization from hot solution. The offensive effluvia are produced during the first stage of the process — namely, treatment of the argols.

Crude argols, contain beside acid tartrate of potash (cream of tartar) and tartrate of lime, considerable coloring matter, mucilaginous and other organic substances, which during solution give rise to very characteristic penetrating and offensive effluvia, which until recently were permitted to escape into the atmosphere. At the French Cream of Tartar Co.'s works, which are the largest of the kind in the United States, improvements have been instituted, which if properly adhered to will do away with this evil; but if improperly or carelessly conducted do not mitigate the cause of nuisance, but rather only serve to render the nuisance more directly felt, at least locally. By condensation apparatus and neutralization of the liquors thus obtained, by use of caustic lime, an entirely inoffensive product results, which is then run into the street sewer. However, if this neutralization is *neglected* or *carelessly conducted*, there will directly be an offensive smell in the locality, as the sewers then serve as *flues* to carry the gases directly into the houses of that region. There exists a just cause for local complaint against this evil.

CHEMICAL WORKS.

Under this general head, a great variety of chemical manufacturers which have not already been mentioned, may be included, which add their share to a greater or less degree to the combined effluvia proceeding from this district, and so justly complained of by New York city's suffering citizens. The following list gives them in the order of their importance in this matter:

Roofing materials, distillers of coal tar; Factory Sixth street and East river, L. I. City.

Chemical Works: Coal-tar products, roofing and paving materials.

Acids and inorganic salts.

Dye-woods and extracts.

Bicarbonate of soda, saleratus, etc.

Standard Chemical Company : Sulphuric acid.

Silicate of soda.

Coloring material for artificial liquors.

Stannate of soda and wrought iron.

Hydrofluoric acid and tin crystals.

Respectfully submitted,

ALBERT L. COLBY, Ph. B.

SCHOOL OF MINES, COLUMBIA COLLEGE, Dec. 31, 1881.

DUTIES OF THE CITIZEN TO THE STATE IN MAINTAINING PUBLIC HEALTH.*

A paper read before the Ninth Annual Meeting of the American Public Health Association, Savannah, November 30, 1881,

BY ERASTUS BROOKS, ONE OF THE STATE COMMISSIONERS OF HEALTH
OF NEW YORK.

The first duty of the State is the protection of liberties of the people, the maintenance of law and order, of peace and power, and to secure, as far as possible, the lives and health of the whole people.

Among the first duties of the citizen is to aid, protect, support and uphold the State, the citizen being part and parcel of it, in the performance of all obligations to persons, communities institutions, organizations and legal authorities. To this secular obligation of common duty may be added so much of that higher law, which, quoting the words of Tiltonson, declares that "religion obliges men to practice those virtues which conduce to the preservation of our health."

"Daily duties paid, hardly at first, at length will bring repose to the sad mind that studies to perform them."

With this text for what I have to say, permit me to give the reason for the faith that is in me, trusting that I may be able to prove and practice the sentiment of one of the poets, that in real life

"The primal duties shine aloft like stars."

If then the State owes order, law and protection to the citizen the citizen owes to the State, in return, allegiance, and self-preservation to himself and to those dependent upon him. The State provides schools for the young, hospitals for the sick, asylums for the deaf and dumb, for the blind, the idiotic, the insane; and poor-houses, reformatories, jails and prisons for the unfortunate and vicious class of people. The greater or lesser number in these several institutions and places depend upon the causes and conditions of those sent, or sentenced to occupy them. The State performs its duty when it provides needed comfort for the absolute poor, and needed punishment for absolute criminals. All beyond this for securing public or private good belongs to personal and responsible administration; and this is true whether the subject relates to institutions or to families. Citizens make the family; families make the State; and States and Territories compose the general government. The safe beginning will, as a rule, always make the safe end. In the State, we are not only to enjoy life, but to live nobly.

*The State Board of Health having delegated Commissioner Erastus Brooks to attend the Ninth Annual Meeting of the American Public Health Association, the following paper was presented to that body by him, and it is now placed in this Board's report as belonging to the continued discussion of the subject which Mr. Brooks presented before the Association and in the Board's First Annual Report [pp. 75-85].

E. HARRIS,
Secretary.

Aristotle most truly said that it is only by labor that thought can be made healthy, and only by thought that labor can be made happy, and the two cannot be separated with impunity; where both are best preserved the State life and the life of the citizen will be most secure. Whoever stimulates research into questions relating to the health of the people, secures as the first fruit of that research a knowledge which benefits mankind. This knowledge is born of observation, and produces the experience which comes from observation. One of the first lessons thus learned is that governments best represent the people, and really only represent them, when those in power maintain what is wise and good, and provide punishment for what is dangerous and vicious.

The State in this sense is a civil power, a political power, a governing power of the many by the few,—the many consenting to this form of government, which means the body politic, united and organized to establish and maintain the rights, interests and welfare of the people. In a limited sense, such a government is a district, a town, a county; and these grow into a commonwealth. In a larger sense, it is a league, a confederation, and that form of federal power which most of us now call and respect as a nation. This is the imperial power of the body politic, united for all the purposes set forth in our constitutional form of government, and from which, short of revolution, there can be no dismemberment.

The first duty is the safety of the republic, and the second, and like unto it, is the promotion of the six great precepts set forth in the preamble to the Constitution; and this is true of the public health which is necessary to all domestic tranquillity, to all that belongs to the general welfare, and I may add, to justice, in the proper presentation of what is due to the people from the State.

I present this branch of what relates to popular government and duty as of the highest importance to the country and to mankind. Therefore, let the public school room, academy, college and university impart what is due to the State in return for what the State has done for them and is always doing for its children.

There should be everywhere sanitary inspections of schools, by competent local Boards of Health and of all public institutions. Among the discoveries which may be made—and I am speaking both from the school of observation and experience—is the cause and effect of those terrible diseases known as diphtheria and scarlet fever, and of all the emanations from malarial poison. Inspectors, teachers and parents, to arrest diseases like these, owe some service to the State.

I need not in this presence say just what this duty is, but for the many persons not here, I may state that among these duties are: Non-communication, isolation, safety from exposure to draughts and colds, the strict avoidance of impure water, the disinfection when required of clothing, of rooms, workshops, dwellings and of all exposed places; the special personal cleanliness of all who suffer, and of all in attendance as nurses or otherwise. Where fire and heat are not applied to get rid of what is offensive, fumes of sulphur, copperas and other effective disinfectants must be used; and when death comes there must be no public or family funeral. "The dead," if need be, "must bury their dead." To save the lives of the living by such means shows no want of sympathy for the dead or for the living, but just the contrary. One bad case of diph-

theria neglected in the school room, the sick room, or in the dead room, may lead the way to a hundred graves. The true parent, the wise friend, the honest citizen, will see that these exposures, so often caused by ignorance or false sympathy, are prevented by the strictest non-intercourse.

New York city saw 8,372 young lives lost by diphtheria alone in the six years from 1874 to 1880; Brooklyn nearly as many more, or 6,904 in the same time, and England over 1,000 in one year as far back as the year 1859. This disease is common and increasing all over our country, and in nearly all parts of the world.

What is true of diphtheria is measurably true of scarlet fever. This may not be so much of a filth disease, but it is communicated to children in the schools, and is, therefore, to be watched. Measles, whooping cough, and chicken pox are also diseases peculiar to children; and to check them, when and where they exist, or are threatend, is one of the constant duties of adults. We know, fortunately, how to arrest the spread of small-pox and the consequences of neglect.*

Not only is vaccination the first remedy, but the first duty, and as a rule, the certain cure. During its general prevalence the closing of churches, of colleges and of all schools and of all public institutions should be secured, and, if necessary, this should be the rule, if required, with all the diseases to which children are exposed.

Subjects to be learned without Direction from the State.

In infancy and early childhood nature provides the most wholesome food, and the best caretaker—including mother and nurse—is the person who studies common-sense rules as to food, raiment, warmth and ventilation. I have seen nearly 90 per cent of children, under two years of age, die in public institutions, and I have seen the lives of children of the same age and the same dependence and condition, where only 8 per cent of the whole number have died in the country nursery and hospital, and not over 14 per cent in the crowded street and city. In both town and country the good and bad results came from good or bad administration, and the good as a rule has been and always will be chiefly directed by voluntary service. Nearly as many persons die from being over-fed as under-fed, and the waste of life and the want of health in cases like these—which may be counted by thousands—is born of ignorance and indifference, for which the State is rarely responsible.

Mental training is another duty of parents and of teachers, and one hardly second in importance for the avoidance of dangers and unwise mental impressions. The brain, next to the stomach, is to be properly cared for to free children from diseases, known as fear, fright, hysteria, St. Vitus' dance, and kindred diseases, caused or suggested by unwisely directed advisors or educators. Let not wisdom linger where knowledge comes, always remembering, for young and old, that where there is cure by prevention there need be no cure by medicine.

What are called domestic pestilences—such as scarlet fever, diphtheria, measles, whooping cough, and even small-pox—are largely preventable diseases, and the remedy is, first of all, personal care, and, secondly, the

* Recently in a single ward in Chicago, where more than 1,300 persons were attacked by this malady 40 per cent of the number died.

proper use of what belongs to the atmosphere of the locality. To know yourself should in all cases mean to know how to take care of yourself, and this in the form of individual sanitation. As vaccination is the preventive of small-pox, the reasonable logic is that every man, woman and child should be vaccinated. Diphtheria, with all its mysteries, is shown to be the result of local conditions, whether propagated, as stated by Professor Horatio C. Wood, by a microscopic plant or fungi from which no one is exempt, and which exists in the mouths or throats of all of us, but with no power of reproduction until it receives fresh vitality from the disordered conditions of the mucous membrane attending sore throats produced by colds. It is a blood poison in the very sources of human blood, and even in the spleen and bone marrow. The poisoned plant extends to the blood when diphtheria sets in, and the disease goes out spreading through all possible surroundings. It is declared to be possible, if existing theories hold good, to kill this human monster by artificial vaccination, and it is at least more than possible that this terrible disease may be modified, if not removed. But as it now is, even the convalescent may communicate the worst infection; and hence the necessity for domestic purification and personal care.

We read daily how and where impure water has produced, perhaps, it should be said, aggravated diphtheria and scarlet fever.

In Memphis we have recently seen the most striking examples of wise and unwise administrations of the people. The change for the better only came after immense losses, suffering and distress; but after it came, it inspired more than a hundred towns in the country to follow one good example. For convenience at one time 10½ miles of wooden block pavements were built in a single year, and the effect of the great wear and tear upon the streets constantly broken for repairs and fixtures produced by the constant attrition and decay, with the constant wetting of storm water, produced a fearful amount of disease. The first cause was a popular mistake in the display of a most unwise zeal in the wrong direction. The wrong done increased the mortality to a small population, or from 29 or 30 in each thousand, to 144 colored people and 92 whites. Proper sewerage or drainage, pure water, the closing up of cess-pools and vaults, restored the ordinary mortality, and the cleansing of the city reduced the death-rate two-thirds. In 1879 the population was reduced to less than 5,000 whites, and in all to little less than one-half, with a corresponding reduction in the value of every kind of property. In 1879, of 7,202 buildings in the city, 1,453 had no air space from the ground. Half of the buildings with basements and cellars had no proper ventilation. Of 4,744 wells and cisterns, 3,408 were near privy vaults, and in 6,000 of these apartments not 2,000 were properly placed or built. And just here, and all through the country, may we find the worst enemies of health and of life.

The National Board of Health, by proper remedies — aided in their good work by the best people — reduced the death-rate 20 per cent in a single year. By a like sanitation the lives and health of very many of the people of Charleston, Mobile, Galveston and Jackson were saved.

The economy of a work like this means, in time, money and work, millions upon millions saved in property, to say nothing of the saving of life and health. Of the deaths in Memphis, 15 per cent were traced to undrained soil and to deficient sub-ventilation in the homes of the

people, while 57 per cent of the total evil came from external causes, and most of all these cases were preventable by care.

PREVENTABLE DISEASES.

First of all under this head is the scourge known as yellow fever, which, as nearly if not all the papers before this body prove, may be greatly modified by sanitation. Then comes small-pox and ship fever, both under easy control, and then follow all those plagues of human existence known as typhoid, enteric and scarlet fevers, malaria, diphtheria (caused by negligence), and meningetis, and measles.

In clean ships there need be neither yellow fever nor cholera. The death-rate in India, by the use of sanitary means to prevent the scourge of cholera alone, was once reduced from 22.41 to 3.29, and later to 1.26. Proper sanitation has reduced the death-rate 6 per cent in Liverpool, 3 per cent in Manchester, and in London from 1,100 in one million, to 400. Sanitation in London has also been reduced in the death-rate from 43.5 in 1685, to less than half this rate in 1880.

FACTS FOR PERSONAL KNOWLEDGE.

1. Carefully studied records show that typhus fever is due to a specific poison, often producing disease, which is conveyed into the human body through the agencies of bad food and polluted air, and especially, in many places, by bad well water, coming from cess-pools and like exposures. Sewer digging is another and serious source of evil.

2. Scarlet fever and scarlatina may be diminished, if not stamped out, by proper exclusions and restrictions in schools, in families, and among large bodies of people collected together. Not alone the personal presence, but even clothing not used for a year, has produced this disease.

3. Diphtheria once started increases in proportion to the neglect of sanitary conditions. Decayed vegetables, fruits, and all perishable fruits and products, if neglected, mean disease; and especially is this apparent where the soil is moist, as near swamps, marshes and immovable bodies of water. Eighty per cent of the worst cases were found at Lynn, Massachusetts, during the worst year of the disease in that locality. The fact of communicating diseases to persons, families, schools and neighborhoods from such causes is beyond dispute. Even the kissing of a friend, or the breath of a friend, may communicate diphtheria. The soil also needs watching whenever this and kindred diseases are found. Malaria is always most prevalent near the surface.

On the marshy district of an infected town on Lake Michigan filth has been traced through the ground over one hundred feet. Where it is the least visible, it is often the most penetrable. All malaria and the miasmatic fevers revel in extreme moisture.

But far more important than what is tangible and traceable are the characters and habits of the people themselves. Children are the first victims, and children can communicate diphtheria to strong mothers and stout fathers. Sometimes this disease comes from natural conditions, but most frequently from positive filth. Surfaces of mud are a part of this filth, and even the sun and air may stimulate it. Though this disease is comparatively new in name, it was christened at Tours, in

France, in 1818, and is even described by Hippocrates. The new facts seem to be its propagation in the form of a microscopic plant.

4. Water used for drinking especially needs watching, and an analysis, where there is doubt or ignorance of its source or supply, is required. The transmission from wells, brooks and springs to dwellings also need watching. Even ice, with the purest surface, may be contaminated where the water is not pure. Polluted waters are rarely detected by touch, taste or smell, and only chemical and microscopic examinations can trace the real source of soil. Surface wells are dangerous and sub-soil wells are undesirable. Rain water is the best of all for purity.

5. Sewer gas is another public enemy. Sulphuretted hydrogen and ammonium sulphide are found in our sewers, creating organic fetid vapors; and these, if not wholly decomposed, make them fatally foul. Even one part of these gases to two hundred and fifty of pure water, in the common atmosphere, it is said, will kill a horse, and double the quantity a dog, and only six parts small birds.

The schoolmaster who teaches whole pages of grammar, books of arithmetic, and the higher mathematics, chapters of logic and volumes of history and literature, should be requested to teach more of chemistry and physiology, of anatomy and hygiene, and even the principles of life insurance may be taught wisely, and timely. Correct speaking, calculation, reading and writing are well; but some knowledge of hygiene, of the structure of the human body, of the stomach and the brain, of the natural causes of diseases, if not their remedies, are at least of equal value. The common schools and academies teach practically little or nothing of these subjects, and even the colleges and universities but very little.

Men of all professions may become public benefactors, as from the desk and the forum they from time to time become instructors of that kind of cleanliness which is practical godliness alike on the person, in the household, and on the water and on the land.

One other source of health, depending more upon the people than the State, may be traced to tenant homes, homes such as have recently been partially begun in New York (where there are upwards of 22,000 tenement-houses), in Brooklyn, and more extensively in England, as described last month by Sir Sidney Waterlow, M. P., when visiting New York, a philanthropist who has given many years to tenement reform. In 1854 he sought to secure, in the humbler homes of the people, immunity from disease, by inspection and safety from fire, and the effect of this little more than individual effort was to reduce the average death-rate from forty to eighteen in each thousand persons, and the rate of insurance, on properly built tenant dwellings, to seven cents on each \$100, with a small rental for each comfortable room during the time of occupation.

The homes of the people are the real sources of happiness, and what is best for health should be established and recognized there, and in properly constructed and regulated workshops, school-rooms and churches. In the latter physiology and physic may at times enter into that divine philosophy which teaches the ways of God to man, and in the very front rank of this intelligence should be the duty and wisdom of creating, establishing and maintaining the health of the people.

The work of Florence Nightingale in England and the Crimea, in peace and in war, in the hospital and in the camp, shows what one woman can do to save life and relieve suffering. In a like spirit, in a

different field of labor, but inspired by the same divine thought, Octavia Hill, in London, possessed for long periods of time various pieces of tenement property, each one wretched in itself, and worse in the character of its inmates, and, as a lessee, visitor and friend, cleaned and repaired, made habitable and comfortable, all these hitherto miserable dwellings. In the same spirit a committee of benevolent ladies, to the great saving of health and life, have in charge as many as possible of the more than twenty-two thousand tenement houses in the city of New York.

This kind of service, much of which, and the best of which, is voluntary, has proved one of the grandest physicians of the land. At times it is seen in the direct cure of maladies, at times in the general diffusion of knowledge, and at times imparting personal comforts and positive civilization in the worst habitations of the land.

I read of the lives of 10,000 children saved in a short time in England, simply by the agencies of proper care in the use of the gifts of God to man. These agencies have been the medicine of nature, prescribed by a little practical wisdom. I read also in thirteen towns of England of a decrease of more than 17 per cent in the death rates from proper sewerage alone; but there, as here, there remains immense room for improvement. In a country like Belgium, the average lives of the cleanly and thrifty are fifty years, and of the filthy and negligent, the average length of life is only thirty-two years, and Belgium in this respect is not a peculiar country.

All of us, my friends, have many and inalienable rights; but the right of moral, physical and material contaminations of the city, the town, the country, the manufactory, the workshop, and of the dwellings of the people, are not among the rights. The State may repress nuisances, may maintain public, and as far as possible, private health; and all good citizens will not only obey the law, but as far as possible also present in their own lives and living a good example of loyalty for the many who are naturally disobedient.

The wise citizen will not only check disease in himself, but, as far as he is intelligent, avoid the necessity of calling upon a physician to cure preventable disease. Still less should the State be called upon to perform any kind of work which belongs to the citizen.

I leave it to experts and to the doctors to be specific as to the origin, character, extent and definition of diseases. As a layman I see and comprehend the effect they have upon organized communities, peoples, and large bodies of individuals. I know what foul air, impure water and bad food mean, and I would, if I could, remove them from all conditions of household and animal life. Yes, and I would, if I could, remove them from the face of the earth. I try to distinguish between abnormal decay, common to human existence, and the decay which comes from disease.

The study of chemical combinations, of biological conditions, and of epidemical relations, as a layman, I may not understand, but every one can comprehend what an epidemic is—when in the midst of it—and if he can trace it to foul water, to exposed cess-pools and other tangible offenses, the way is pointed out to remove the cause and to remove the effect of the evil. The sick animal and the sick plant, and whatever causes or enters into the decay of man must be cured, or the natural consequences follow. It is enough to know that the presence and

spread of filth means the presence and spread of disease. There may be other causes of sickness, but this one is self-evident, tangible and remedial, which may not be the fact with the class of diseases caused by air and climate and the atmosphere alone, or by diseases which only skill and study can detect and cure. In the country a belt of trees and a sheet of water, absorbing disease, have often arrested its progress.

The art of prevention in disease, as in other results, is, therefore, the best lesson for the teacher and the student. As the proverb says, "An ounce of prevention is better than a pound of cure." Even the brute creation, as in the marshes near Rome, have, through experiments, shown symptoms of malaria produced by infection of the soil and air.

These lessons are of more importance in crowded communities, and in certain climates, than in the rural districts, or where the air and atmosphere, as by the sea and on the mountains, are of the greatest purity. Every day's record from the large cities teaches us that where there is most life there is most death, even apart from great numbers of people; and much more care, therefore, is necessary to preserve life where the largest number of people are found.

It was the careful statement of your presiding officer, President Billings, last year at New Orleans, that 100,000 lives were lost each year from sheer neglect, and 200,000 cases of prolonged sickness are added during the same year. In reality the dead and the sick, who might be saved, are far beyond these figures. I will not repeat my estimates of last year as to the money and business value of each of these lives, but the loss and cost and value of each one presents a fact beyond dispute. The greatest loss is during the age of childhood; but neglect, ignorance and vice spares neither age, condition nor sex in any of the years of our lives. Of the young it was truly said by Irwin Greenhow, in a report to a general board of health, that the death rates were among the most important studies in sanitary science, because, first of all, they give a very sensitive test of sanitary circumstances; and, secondly, the places where they are most apt to die are necessarily the places where survivors are most sickly, and where, if they survive, they beget a sicklier brood than themselves, even less capable of labor and less susceptible of education. A high local mortality of youth must almost necessarily denote a high local prevalence of the causes which determine a degeneration of race. Dr. West also says the frail child never passes completely into womanhood, but fades and droops in the transition stage through which she has not the strength to pass; and this is the sad record of advancing years. We know from sad experience, how, in the State, pauperism may be perpetuated in the double form of immorality and disease.

Dr. Jarvis, of Massachusetts, in his work on the political economy of health, says that in the seven years from 1865 to 1871 72,727 died in their working period. In the fullness of health and completeness of life they would have had opportunity of laboring for themselves, their families and the public 3,006,350 years, but the total of their labors amounted to only 1,681,125 years, leaving a loss of 1,925,224 years by their premature deaths. This was an annual loss of 276,461 years of service and co-operation. Thus, it appears, that in Massachusetts, one of the most favored States of the country, and of the world, those who died within seven years had contributed to the public support less than one-half, or 46.07 per cent, of what is done in the best conditions of life. He also adds, confirming what I have already said, that it is estimated by

English observations and calculations—no notice is taken of sickness for less than a week—that for every death there are two persons constantly sick; and that means 730 days sickness and disability for every death.

In 1870 in Massachusetts, amongst the people of the working age, there were 24,554 years and eight months sickness, or disability; or just so much loss of labor.

In contrast to this sad record, let me say that upon the whole the health service of the country, and of the world, is certainly improving; but while this is true, it is necessary to add that, as an entire people, we are only in the beginning of the required work of real civilization. The death rate in the United States army from all causes is but nine per thousand of white men and twenty per thousand of colored troops.

The last annual report of Surgeon General Barnes shows that among the white troops the total number of cases of all kinds reported on the sick list was 37,408, being at the rate of 1,768 per thousand of mean strength. Among the colored troops the total number reported was 4,600, or 1,984 per thousand of mean strength. The total number of deaths from all causes among the white troops was 197, or a death-rate of nine in 1,000 of mean strength; and the total deaths of colored soldiers from all causes was forty-eight, or twenty in 1,000.

In my own State I record with satisfaction that since the establishment of the State Board of Health, as many as fifty, and at one time sixty, local Boards have been organized in a single month. They now exist in the twenty-four cities, three hundred villages, and in nearly all of the towns of the State. The cause of this improvement is due to the fact that physicians in many of the counties of the State, supported by boards of supervisors, village trustees, county, town and district clerks, and, indeed, by nearly all county officers, have been requested to co-operate with the State Board of Health in calling attention to, and in maintaining, public health at home, and to this end they were asked to respond to any and every call looking to private work, and to public meetings for the consideration and discussion of measures relating to drainage, sewerage and general cleanliness; to the ventilation of schools and public institutions; to the supplies of pure water; to the proximity of wells to cess-pools and water-closets; to the adulteration of food and drugs, as affecting health, and to all general work which seeks to secure the health of the people. Work at home, as the best missionary field of labor, is the first improvement needed. The best work always begins there.

When, many years ago, Lord Palmerston met his Scotch petitioners, asking for a day of fasting and prayer, he gave them the wise but rather startling answer: "Go home, and see that your towns and cities are freed from those causes and sources of contagion which, if allowed to remain, will breed pestilence and be fruitful in death, in spite of all prayers of a united but inactive people!" And Ruskin, at a later day, declared that "any interference which tends to reform and protect the health of the masses is viewed by them as unwarranted interference with their vested right to inevitable disease and death." Yet this amiable cynic induced Octavia Hill to invest ten thousand pounds sterling of his money in the lowest quarter of the city, where she might witness the transforming power of its worth in sanitary reform. And so this noble woman, aided by Ruskin's magnificent donation of money proved that wealth is health and that health means the happiness of the people.

In this spirit, Ralph Waldo Emerson, many years ago, in his words on "One in Robust Health," said, in a spirit which I have endeavored to inculcate. "The first wealth is health. Sickness is poor-spirited; it must husband its resources to live. But health answers its own ends, and has to spare; runs over and inundates the creeks and neighborhoods of other men's necessity."

Let me prescribe one other rule of business, and for domestic and public duty; banish from your dwellings all possibilities of contamination from effete matter, all noxious and miasmatic gases from fecal decompositions resulting from soil and sewer pipes. Obstructed pipes send back into your closets, sinks and basins the foulest odors, and only the freest flow of water can keep them clear and clean.

If the sources are all pure and the road straight and clear, there is a way of escape. The head of every house and building should be practically a health inspector. Open the doors and windows of your dormitories and school-rooms, that the air of heaven may enter therein. A little care will shut out filth and darkness, and make room for the light of heaven and the vigor of health. One marked feature of our American life is the disease known as fret and worry.

The haste and zeal of the times causes what is called "American nervousness," which means mental and physical derangement, and which, in turn, again means what has been characterized as hypotism, hysteria, catalepsy, somnambulism, and other preternatural and abnormal manifestations and hallucinations, as seen, in part, in Guiteau's villainous purpose, whatever the measure of his alleged insanity, for killing President Garfield. Some of these evils are born of deceit, passion, vanity and imposture. Others are born of intemperate lives and habits and education, and produce insomnia, dyspepsia, irritability, and a long train of nervous diseases, or disorders, characteristic of the times and the people. These are the diseases which lead the way to asylums for the idiotic and the insane, where it is so hard to—

"Minister to the mind diseased,
Pluck from the memory a rooted sorrow;
'Rase out the written troubles of the brain;
And, with some sweet, oblivious antidote,
Cleanse the stuff'd bosom of that perilous stuff
Which weighs upon the heart."

The only offset to this amount of fret and worry is a corresponding reduction of inflammatory diseases; and this, it is said, is almost, if not quite in proportion to the growth of nervous irritability, and also a corresponding increase of longevity where, as one reads, diseases of the many have been most apparent.

But leaving all these specific references to life and death, disease and cure, let me return and close with a single reference as to the duty of the citizen and the obligations of the State, condensing both in the words of another: "Duty is a moral obligation imposed from within: obligation is a duty imposed from without. Duty implies a previous obligation; and an obligation involves a duty. * * * My obligation is to give another man his right; my duty is to do what is right. Hence duty is a wider term than obligation. Duty and right are relative terms. If it be the duty of one party to do something, it is the right of some other party to expect or exact the doing of it."

MODES AND EXAMPLES ON SANITARY PROCEDURE, ETC.

At the annual meeting in May, 1881, and subsequently, the Secretary was directed to prepare a circular of information upon the best methods of procedure by local sanitary authorities, under the amended laws, against nuisances and other sources of damages to public health. The Board having directed that suitable and most economical plans for contagious disease refuges should be prepared as an appendix to such circular, and that the whole be issued to all local Boards of Health and also be printed in the Second Annual Report, that document is here presented.

E. H., *Secretary.*

[No. 27.]

STATE BOARD OF HEALTH OF NEW YORK.

DUTIES AND PROCEDURES OF LOCAL BOARDS OF HEALTH AND THEIR OFFICERS.—EXAMPLES, METHODS AND SUGGESTIONS.

The laws require the Health Boards to "have cognizance of the causes of injury or danger to the public health." Full power is given every Board to make and enforce regulations and orders of *general obligation*, which shall be published and obeyed as laws; also to make *special orders*, without publication, to be immediately enforced for the suppression of nuisances and of sources of contagious diseases or other great dangers to life and health. In this circular the State Board of Health presents a practical view of sanitary procedures, as they relate to nuisances, the protection of health in schools, the removal of causes of malaria, and the control of contagious diseases. In this service, every local Board of Health is required

To be organized according to the statutes.

To have "a competent physician as Health Officer."

To adopt and publish regulations and orders of general obligation.

To prescribe "the duties and powers of the local Health Officer."

To give information to all inhabitants concerning their duties in regard to the registry of deaths, births and marriages, the burial of the dead, and the sanitary care of contagious diseases, and to designate the persons who shall grant permits for the burial of the dead.

To notify all physicians, clergymen and magistrates of their duty relating to certified records for registration.

To make and preserve accurate records of all official proceedings, and to require the Health Officer to do so in his service.

To cause every case of small-pox to be reported immediately to the local Health Officer, and to require him to report to the State Board of Health the fresh outbreaks of that contagion the day he verifies the cases; also to report to the State Board monthly.

All citizens should be free to enter complaints, and the Board should supply a form and a book for recording such complaints.

PROCEDURES AGAINST NUISANCES.

Under the Board's instructions its Health Officer, or other qualified person, must inspect, examine evidence, and make his report to the Board, as the preliminary step to his formal complaint or an official order. Notification, official advice, and a summary or informal order may be usefully given without delay. The formal complaint and order must state that the offense is in violation of a regulation or order of the Board, or that it is "dangerous to life and detrimental to health;" or, being on or near a route of public travel, is noisome or detrimental to public health." Such specific complaints and orders will chiefly relate to scavenging and removal of filth-nuisances, disinfecting, etc., draining, and removal and prevention of obstructions; also cleansing and filling, grading, ventilating, lighting or regulating tenements and places of assemblage, the prevention of noxious emanations, etc.; the isolation and control of dangerous contagions, and the necessary interference with any other causes of imminent peril to life and health.

ILLUSTRATIVE CASES IN PRACTICE.*

The Board of Health in the town of V—, at its stated meeting June 25, having already adopted and published the first *eleven* sanitary Regulations as advised by the State Board of Health [*Paper No. 26*], took action as follows:—

For the removal of marshy and malarial borders of a mill-pond, seven acres in extent, in the village of M—. Upon complaint of the Health Officer and on personal inspection by the Board,

"*Resolved*,—That the Secretary serve the following notice upon Messrs. B. and A, as part owners, and on Messrs. A. B. and E. B. as part owners and lessees:— That they are hereby ordered to remove and drain the marshy borders of the mill-pond hereby declared to be a nuisance,—situated on their respective lands and under their control, on or before the 20th day of July, 1881."

For the Abatement of an Old Slaughter-House Nuisance, and for the Cleansing and Disinfection of the Building.—Upon complaint of the Health Officer, and after inspection by the Board on the 19th of June,

"*Resolved*,—That the Secretary of this Board serve the following notice upon H. S—, the owner:—

"That she is hereby ordered to remove and burn all boards, timbers and other things which are saturated with animal matter in and about the building known and used as a slaughter-house on the western border of the mill-pond marsh, on C— street, and that the building be thoroughly fumigated, cleansed and disinfected, on or before the 20th of July, 1881."

*The examples here given have occurred during the past twelve months. The forms of procedure are such as will be found most convenient and effectual in daily sanitary service.

To Remove a Cause of Pollution of a Running Stream used for Domestic Purposes.

"*Resolved*,—That the following notice be served by the Secretary on C—— S——: That he is hereby ordered forthwith to remove or burn the dead horse which he has buried near a running stream at ——."

Complaint by Citizens, and summary Orders from the Board of Health, served by Health Officer, under the published regulations. Report of service and compliance:

COMPLAINT —

"*To the Board of Health, village (or town) of* —— :

"Take notice that there is, upon the premises owned by J—— K——, and occupied by Mrs. ——, at No. ——, —— street, an overflowing privy-vault; and that I hereby complain of the same as a nuisance."

"Dated ——, N. Y., this 7th }
day of May, 1882."

"C. H., *Complainant*."

Upon this Complaint the Health Officer indorses, and returns to the Board —

CONCERNING NUISANCE AT ——
"To the Board of Health of" :

"I certify that on the 7th day of May, 1882, I received the within complaint, and that on the 7th of May I examined the premises and requested the owner to remove the contents of privy-vault. This he did *partially*;—the nuisance remaining. June 7th he was served with *notice to abate* within 3 days. June 10th it was found abated."

"(Dated) ——, ——, *Health Officer*."

COPY OF ORDER TO ABATE.

"To Mr. J—— K——:

"You are hereby required within 3 days to abate a nuisance upon your premises on ——, in —— village, viz., an overflowing privy-vault and a cesspool in front of said premises, or the same will be done, and the expense thereof collected from you, together with the penalty of neglect in relation thereto."

"By order of the Board of Health."

——, *Health Officer*."

NOTE.—This order was served on owner and the tenants at the same time. It was fully complied with by J. K., the owner.

Summary Order for Abatement of Nuisance of Stagnant Water, and an old Cistern, by the Board of Health of the town of ——:

"To ——, owner and occupant of premises on the corner of I—— and W—— streets:

"You are hereby notified that the stagnant water upon your premises and bordering upon the public streets here mentioned, and an old cistern there situated, have been declared a nuisance by this Board, dangerous to life and detrimental to health. You are hereby required to abate said nuisance, within three days from the date hereof, by filling up said cistern, removing all rubbish and obstructions to drainage, and by keeping the said premises so drained, as to be free from all surface-water."

Local Sanitary Officers Obstructed.—Outbreak of Diphtheria in a Summer Resort of Families.—Notices by telegraph and mail were received by the State Board of Health announcing an outbreak of diphtheria, stating that the owner refused to comply with the sanitary requirements of the local Board of Health, and requesting inspection and advice by the State Board.

Inspection and Report by Commissioner and a Sanitary Engineer of the State Board of Health :—“Found four large buildings occupied by 300 inmates, mostly in families. It is a family resort and summer hotel. Six cases of diphtheria had occurred,—one suddenly fatal.

“*Drainage and Sewerage.*—Conducted from all directions in the basement under the largest building to a central receiving vault, which is an untrapped cesspool immediately under the center of said building. Numerous water-closets, urinals, ice-boxes, provision-chambers and pantries drain into this cesspool. The slop-sinks are untrapped; the basement floors and joists are rotten and the decayed flooring of many of the basement rooms has been torn up and laid in piles. Accumulated filth, cart-loads of rotten floorings and mud about the water-closets of the basement, endanger the inmates of the buildings. None of the closets, slop-sinks, etc., are stench-trapped. Stench everywhere.

Ventilation.—The bath-rooms, water-closets, slop-closets and privies in each of the buildings have no ventilation excepting through the apartments in which situated. The basement and cellars are chiefly ventilated directly upward through the ‘rarefied atmosphere of the several buildings and their corridors and promenades.’”

Action by the Local Board of Health.—Based upon the details of the inspection, minutely recorded, the village Board of Health immediately convened and unanimously issued its sanitary orders covering eleven specifications of work to be forthwith executed, by the owner of the property.

Remark.—In this instance the State Board provided the expert inspection upon which the orders were made and carried into execution.

The first order was in the following terms: “To empty, cleanse and disinfect the great cesspool or receiving vault in the basement at the head of the main sewer and the pipes discharging into it; to remove all obstruction from the house sewers, and ventilate the receiving vault by a shaft six inches in diameter, which shall be carried above the highest point in the roof; to have flag-stones over said cesspool or vault laid airtight in cement.”

This instance illustrates the way in which a local Board of Health may appeal to the State Board. Local Boards, under the amended law, have the right to enter and examine, for sanitary purposes only, any place or premises. (See subdiv. 3 of § 3, chapter 351, 1882.)

Case of a Badly Ventilated School-house—its Cesspools returning their Gases into it.—The physicians in the town of C— have for years quoted the enormous rate of sickness and mortality of the pupils in Public School No. 4, as evidence of unhygienic conditions that should be officially abated and prevented in and about said school-house. The local Board of Health inspected the premises, and early in December, 1881, with the aid and specifications of a sanitary engineer, instructed the school officers to close several class-rooms forthwith, and make certain changes and repairs specified in the engineer’s report. Those specifications were, * * * that,—

(a.) No provision whatever exists for ventilation of the basement and first story of the building ; and, with only a single exception, the same is true of second story.

(b.) The heating apparatus derives its air supply from the basement room that is occupied as a janitor's dormitory.

(c.) The three water-closets in the basement discharge into a horizontal pipe that passes under the cellar floor, onward to the cesspools in the yard. There are hopper-closets in the yard, all unventilated and in foul condition. * * *

It is required that changes and improvements be made as follows :

(1.) *Ventilation—first story*—A board six inches wide, to be fitted close to lower sash of windows, so that sash may be raised sufficiently to admit a copious supply of fresh air between top panes of the lower and the bottom panes of upper sash, without draft across the heads of pupils. Let the windows of second story be treated in like manner; also from ceiling of centre of each room of this story conduct a galvanized iron cylinder or air-shaft, for exit of foul air, through and to a height of two feet or more above the roof. Place regulating registers at lower end of these air-shafts, flush with ceiling. Cover tops above roof with cowls.

(2.) Basement and its quarters for janitor to be vacated, and kept ventilated through-and-through.

(3.) The air-supply channels to take pure air from above, and none from basement.

(4.) Remove water-closets, and substitute suitable ones with adequate means of flushing and constant cleansing [specifications submitted]. Every closet in the house to be ventilated by shaft from trap, separately, to above the roof [specifications given]. The filthy hopper-closets in the yard to be superseded by suitable substitutes [specified].

Action by Board of Health and School Trustees—The Trustees suspended the school in those class-rooms which the Board of Health condemned, and made the improvements as specified. On the 2d of February the Board reported that the work was well executed, and the class-rooms all fit to be re-occupied. After four months the teachers and sanitary officers report that, though overcrowded, no sickness or deaths have occurred. Trustees report that further improvements will be made during summer vacation.

PROCEDURES BEFORE THE COURTS.

The public Health act, chapter 351 of 1882, provides for three classes of cases, and suitable methods of procedure, before any court of competent jurisdiction.*

First. Under subdivision 7, section 3 of the act, the Board may issue warrants to any constable or sheriff, which shall have the force as if issued out of a court of record, and which shall forthwith be executed by said officers, for the purpose of instantly controlling causes of great

*The courts of competent jurisdiction for merely enforcing the Board's orders without waiting indictment and conviction for misdemeanor are: (1) The Board itself, for determining the facts concerning failures or refusal to obey sanitary regulations or orders, when a fine not exceeding \$100 may be imposed by the Board; (2) a police justice or any justice of the peace; and, (3), any court of criminal jurisdiction for violation of laws against harm to life and health. Boards of Health may ascertain what is most expedient in law procedures by consulting the District Attorney or other competent counselor-at-law. Concerning these points the Attorney-General has stated that the remedies for violations of the health laws, and of the orders and regulations of local Boards of Health, are threefold:

danger to public health, and to apprehend and remove persons who cannot otherwise be subjected to the sanitary orders and regulations.

Second. To impose penalties directly for violations of, or non-compliance with, sanitary orders and regulations, and to maintain actions in any court of competent jurisdiction, and collect such penalties, not exceeding one hundred dollars in any one case. Also to sue for and collect the costs that have been incurred by the Board or a contractor under the Board in the execution of its order, whatever the sum may be.

Third. To bring offenders before the courts upon charges of misdemeanor, for violation of, or non-compliance with, sanitary regulations and orders, to be prosecuted and punished as provided by section 4 of the general Health act.

In all these procedures by a Board of Health, the law has fixed the nature of the offense in such manner that conviction thereof *may* be had without a formal indictment; yet in all cases of accusation of misdemeanor (as under section 4) the accused person has the right to a trial by jury, if he so elects; otherwise, *conviction* and *penalties* may be determined by any court of competent jurisdiction as respects the particular case or class of cases. All costs incurred by the Board in necessary execution of sanitary orders may be collected as provided in sections 3 and 4 of the Health act.

SANITARY CONTROL OF INFECTIOUS AND CONTAGIOUS DISEASES; THEIR ISOLATION OR QUARANTINE.

Diseases propagated by contagion, also those caused by local conditions which should be controlled, removed and prevented, produce a large proportion of the sickness and mortality in the State.

Small-pox, diphtheria, scarlatina, typhoid fever and many other diseases are spread from house to house, and from place to place by infection. Dysentery and the diarrhoeal diseases generally, malarial fevers and some other maladies are produced by local causes, which require definite action for their removal and prevention. The drainage, cleansing, drying, ventilation, etc., which are necessary to prevent disease, require sanitary inspection and suitable sanitary work.

The diseases which spread by personal infection, have to be controlled and "stamped out," by definite restraint upon the intercourse and exposure of individuals, by **separation or quarantine** of the sick

(1) Criminal proceeding. Willful violation or refusal to obey any order or regulation duly made, is, by section 4 (ch. 361, Laws 1882), and by section 397 Penal Code, made a misdemeanor, punishable by fine or imprisonment or both. Generally speaking, courts of Oyer and Terminer, and courts of sessions in counties have cognizance of these offenses; so also have certain local criminal courts in cities. The method of procedure in both the courts of Oyer and Terminer, and in the courts of sessions is by indictment.

(2) Civil proceedings for the recovery of the expenses incurred by the Board in summarily abating nuisances under section 4, chap. 361 of Laws 1882.

(3) Civil proceeding for the collection of penalties imposed under the authority of subdivision 9 of section 3.

The two latter proceedings are cognizable by civil courts having jurisdiction of the persons who are parties, and power to render judgment for the amounts demanded. Justices of the peace can give judgment to the amount of \$200. County courts and the supreme court, likewise have jurisdiction, but recovery must be had to the amount of \$50 to carry costs, recovery of a less amount subjecting the plaintiffs to the payment of the defendant's costs.

All of these remedies are concurrent, and can be resorted to in succession where either one proves ineffectual.

In addition to these remedies under the statutes for the enforcement of Health laws and regulations, there are also the old remedies, civil and criminal, for the abatement of nuisances, at the common law.

and of all infected things and places, and by thorough cleansing and disinfection of whatever is infected or has been exposed to contagion. Whatever is necessary in such procedures may be best illustrated by examples in practice, as here shown.

CASES AND SANITARY PROCEDURES IN PRACTICE :

Every case of small-pox, diphtheria, scarlatina, typhus or typhoid fever or other infectious malady, being,—by sanitary regulations,—in every town, city and village, *reported to the local Board of Health as soon as known*, the action taken by the physician, the family and the health officer should be,—

(1.) To separate the patient or patients, from all persons liable to take the disease.

(2.) To provide such perfect sanitary care for the sick and such prompt and complete disinfection for the apartments, clothing and other things that require disinfection, that disease shall not spread from them.

Duty of physician, householder and family.—Small-pox, diphtheria, scarlatina, typhus or typhoid fever being discovered and certified to exist in any house, the physician in attendance and the householder, or family where the disease appears, is required to give notice to the health officer, or if there is no health officer, then to the nearest member of the Board of Health, stating the name, age and circumstances of the sick person or persons. The medical attendant should at once separate the sick from all others than those who have the care of the cases, and should also carefully instruct the family concerning duties to themselves and to the sick.

Duty of Health Officer and Board of Health.—Be prepared to give specific directions, both verbally and by the printed card, showing precisely what to do, what to avoid, especially in regard to the apartments and persons where the sick are, the care and disinfection of all things that can communicate the disease, and also in regard to the rules concerning improper intercourse with and movements of the sick and whatever can convey the disease; also sanitary purification required at the termination of the case. The official card for this purpose should be placed in the hands of those in charge. The medical attendant is responsible for the duty of faithfully enforcing such rules and regulations as long as the sick and the family are under his professional care.

The sanitary authorities should direct the methods and extent of disinfection, but it is usually best to do this by the help of medical attendants, in no case, however, permitting these duties to be omitted. The official notice to the households and their medical attendants should state these rules and duties plainly and briefly. The following is a suitable form for such notice to the family or their physician or otherwise:

A—B—being sick with [small-pox] must be kept entirely separate from all persons except the appointed attendants, and no others can be allowed to remain upon the same floor of the house, unless they have had small-pox, or been successfully vaccinated within a few years. The directions given in Nos. 15, 16 and 41 of the State Board of Health papers should be faithfully followed.

The attendants, as well as the sick themselves, should be kept entirely away from all persons who are not already protected against the contagion. The attending physician, and the undersigned, will give any information desired in each case, and the official release from sanitary restrictions will be given in writing as soon as it safely can be.

By order of the Board of Health,
(Signed)

Health Officer of _____

Quarantine and other Sanitary Orders against Contagious Disease.—

Though it is presumed that the health officer and the Board of Health will, with rare exceptions, have the confidence and concurrence of the people, so that sanitary orders and instructions will be promptly complied with, the law provides suitable means for enforcing any necessary order of the local Board of Health.

An order for the isolation or quarantine of any source of dangerous contagion is absolute in its nature, and must be promptly obeyed; and under sections **three** and **four** of the Public Health Act, as amended in 1867, 1881 and 1882, it is provided that "*Every person who shall willfully violate or refuse to obey any order or regulation, . . . so made and served shall be deemed guilty of a misdemeanor,*" and by issuing its warrants to the constable, the Board may "*apprehend and remove such persons as cannot otherwise be subjected to the orders and regulations by them adopted.*" In the execution of such orders the officers are required "*forthwith to execute them, as if the same had been duly issued out of any court of record.*"

Small-pox, diphtheria, typhus, typhoid and scarlet fevers and cholera may occur under circumstances that require such prompt action. The State Board has issued special sanitary papers, **Nos. 13, 14, 15, 16, 38** and **41**, to aid health officers and families in their duty concerning these diseases.

Records of deaths and prevalent diseases.—The laws require these records to be returned to each local Board, as well as to the State Board of Health, by the health officer. Card No. 30 has been prepared for this purpose, and is supplied by the State Board. Cards 31 and 52 are for use by the medical attendants upon small-pox and diphtheria, and are supplied by this Board to physicians through the local Board.

Temporary Quarantine,—Refuge and Hospital.—There are four ways of quickly providing a suitable refuge and hospital for contagious disease.

- (1.) At home, upon the upper floor, or in any completely secluded part of the house—cleared of all occupants, except the sick and attendants.
- (2.) A separate little building suitable for a Hospital Ward ready for use.
- (3.) A Board Hut or a Pavilion, hastily constructed for the purpose; or
- (4.) a Hospital Tent and Fly canopy. These are the safest kinds of Contagious Disease Refuge during the warm season.

The *first* is the common expedient. It is best that the entire floor, or that a separate quarter or end of the dwelling be set apart for the domestic quarantine of the sick.

The *second* is occasionally the most available and suitable method. Such a separate building should be in a healthful spot, and thoroughly ventilated.

The *third* is frequently the best method of quickly and effectually providing for any increasing number of patients. The annexed plan and specifications for a Contagious Disease Refuge and Hut, is designed to show what may be constructed in a single day to meet an emergency, such as frequently occurs in villages, alms-houses and asylums. The Hospital Tent is the best kind of refuge in the warm season, if the tent-canvas and materials are at hand. The annexed plans and directions for the Tent-Hospital will be readily understood.

These methods need no further explanation in this circular; yet as regards any method of isolation, removal, and the quarantining of contagious diseases, *we must be careful to do the sick no harm* while the people are being incited to the duty of removing and preventing the causes of disease.

The objects of this circular will be attained if health officers and Boards of Health find their duties made clear and their work facilitated by it.

Prepared and submitted by order of the State Board of Health.

ELISHA HARRIS, *Secretary.*

NOTE.—The State Board of Health having repeatedly considered the duty of advising local Boards to prepare for the refuge-care of acute contagious diseases, instructed its Secretary "to have the most suitable plans and specifications for such Refuge-Hospitals published and distributed in the form of a Circular. These specifications and plans, as seen upon the following pages, were appended to the foregoing examples and methods of procedure, and have been furnished to all local Boards and health officers in a pamphlet now known as [No. 27] in the State Series of Sanitary Papers.

[No. 27.]^a

STATE BOARD OF HEALTH OF NEW YORK.

CONTAGIOUS DISEASE REFUGES:—TEMPORARY HOSPITALS

FOR

SMALL-POX AND OTHER PESTILENT CONTAGIONS.

Prepared and Distributed under Instructions from the State Board of Health.

BY THE SECRETARY.

The illustrations upon the next two facing pages present examples of the most suitable and readily erected Hospitals and Refuges for contagious diseases that need to be quarantined.

PLATE I shows Refuge-Huts, and accessories, built of wood.

PLATE II shows Refuge Tent-Hospitals.

No. 1, & A, in Plate I, show the plan of a temporary hut which can be erected and made ready for two patients in a day or night. Length, 22 feet, width, 10 feet, and height (average), 12 feet. Total cubic feet of air-space — 2,640.

This little hut or pavilion (1 & A) has four or five windows, and may be warmed by a stove. It is designed to meet the first urgent necessity for quarantining one or two patients until a larger structure (2 & B, C, D) can be erected for greater numbers, when this may be reserved for convalescents. If only two or three patients are to be so placed in Hospital this hut is sufficient. [The cost of it, at the lowest, is about \$65.]

No. 2 & B, C & D, show plan of a larger structure in which from six to nine patients, with the same kind of contagious diseases can be well accommodated. Its accessory structures may be erected after the shelter for the sick is completed. This pavilion is 22 feet by 30 feet, — 660 square feet of floor-area; with a mean height of 14 feet. Total cubic space — 9,240 feet. The length may be increased at pleasure. Every 10 feet of such increase will add 3,080 cubic feet of air-space, and enough for two or three additional patients. There should be no partitions (unless deemed necessary for locked separation of sexes). The floor-screens, — C, D & G, — are the only means of separation ordinarily needed.

No. 3 (& F) is the plan of an accessory building, with shed-roof and five or six compartments. Its front line is 20 feet back from the sick ward.

No. 4 shows all that is needed for a disinfecting-room and a dead-house. (Needed in an epidemic.)

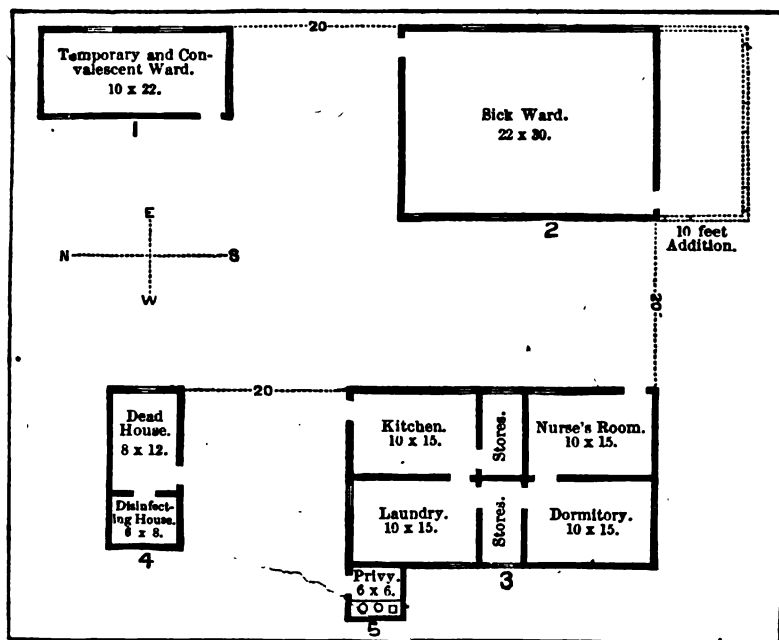
No. 5 (& E & E') shows plan of privy arranged for sanitary security, at least cost, as a disinfecting and dry-earth closet. Its tubs are the halves of a kerosene barrel.

Fig. A shows south-end view of No. 1, the temporary and convalescent ward.

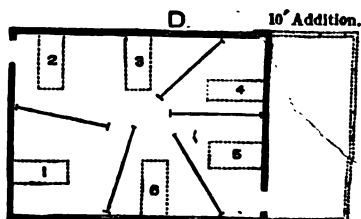
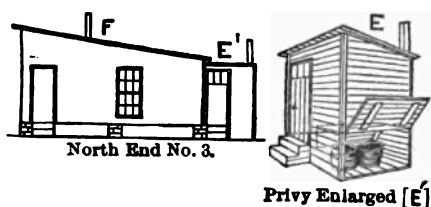
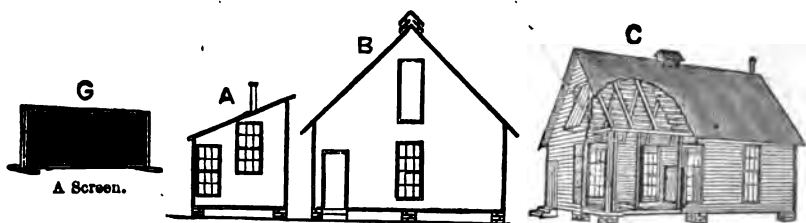
B presents a view of either end of No. 2 and C, with the end windows and one of the doors.

[SEE ENGRAVED PLATES ON FACING PAGES 412-13]

CONTAGIOUS DISEASE REFUGE AND HOSPITAL.



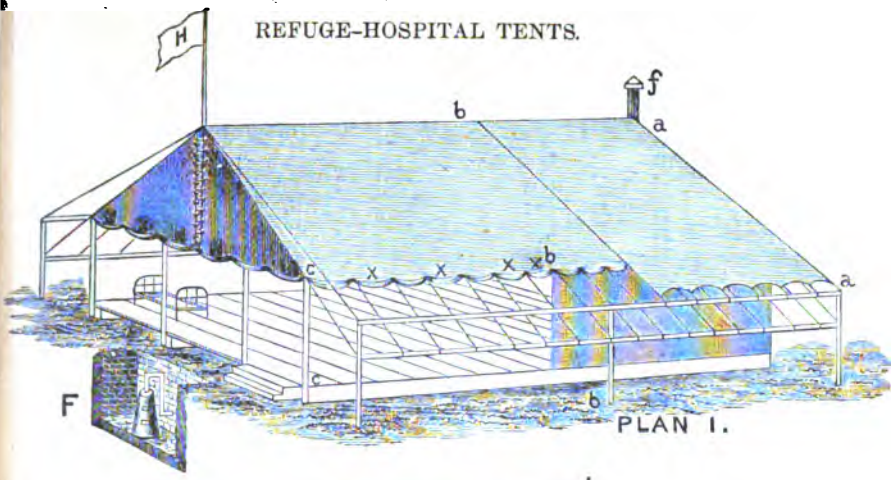
Inclosed Area, isolated, as here shown, 76 x 92 feet.
[This quarantine-ground to be extended 50 to 100 feet on each side.]



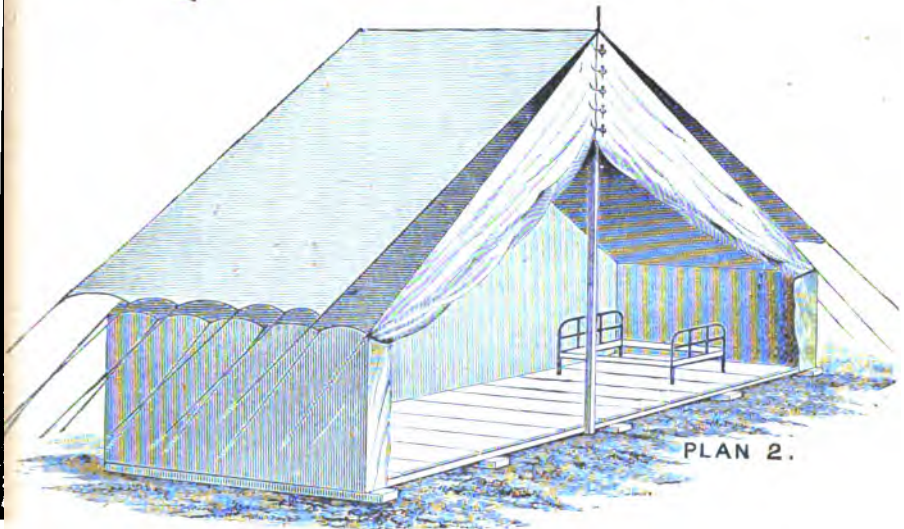
DESIGNED BY STATE BOARD OF HEALTH OF N. Y.

Del. by R. Prescott, Sanitary Engineer.

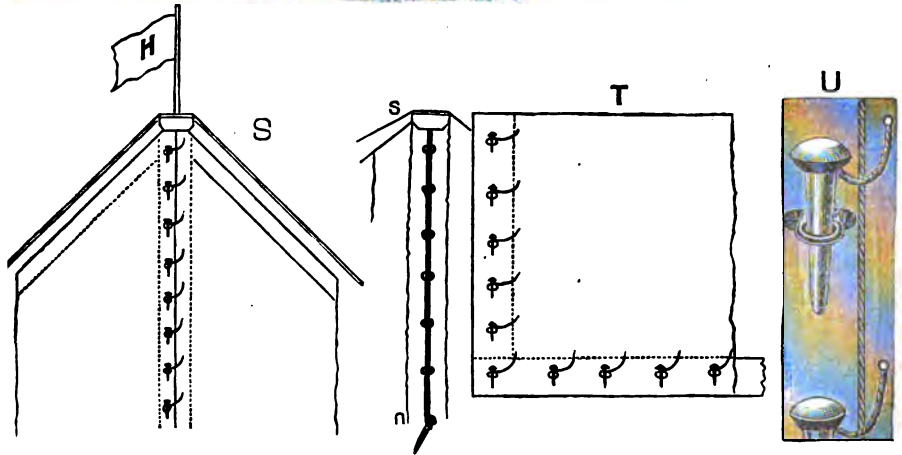
REFUGE-HOSPITAL TENTS.



PLAN 1.



PLAN 2.



Modes of Closing and Fastening Canvas.

C gives an interior (broken) and an exterior perspective view of pavilion 2 & **B**. The positions of its ridge-ventilator, and its gable window swung on an axis,* are seen.

D shows the ready subdivision of floor into bed-spaces that may be separated at pleasure by the movable screens. [**G**.]

E & E' & **5** are views of the privy, etc.

F is the north end-view of kitchen, laundry and privy.

G shows face and feet of a screen; length 10 or 11 feet; height 5 or 6 feet. Two flat-feet of plank-strips, with firmly fastened end standards and a cross-bar, with a face of stout muslin stretched and fastened by moulding-cleats and headed tacks*, are all that are required for such screens. The muslin may at times be used as the means of disinfecting the ward-atmosphere by the alkaline Permanganate or spirituous Thymol solutions, which may be painted upon the screens as required for evaporation, continually, or at intervals.

REFUGE-HOSPITAL TENTS -- PLATE II.

PLAN No. 1 shows a well-floored and warmed Tent-Hospital, with an extended *Fly*. The whole, or any section, may be open at the sides and ends, and any section may be completely or partly closed, at the option of the physician. As here seen the floor and sides and south-west end are open (b to c), the rolled canvas is looped up at **x x x**, to be let down in a moment, and fastened, to protect any section or all sides.

As here seen the tent-floor is supposed to be 20 by 40 feet, — 800 square feet area. The mean height is 12 feet. Total cubic feet of space within the Tent, — 9,600.

F shows a jacketed stove; and **F f** shows the course of the hot-air flue, which is a large sheet-iron cylinder within which the smoke-pipe from **F** extends to chimney-pipe **f**.

PLAN No. 2 is an ordinary Hospital-Tent, with the *Fly* spread as a double roof; but that, or another *Fly*, may be extended in front (to south-east) and the extent of flooring may be doubled and the hospital capacity thus increased. The floor-area, as here seen, is supposed to be 14 by 16 feet; and when extended, — for a *Fly*-canopy, — it would measure 16 by 28 feet. The latter is sufficient for four or five patients and an attendant; the former for one or two. Where the materials are ready, and in good military order, this kind of Tent-Hospital can be erected and prepared in an hour from the time the grounds and floor are prepared.

S, s, & U, show the method of *fastening* the overlaying margins of canvas at the gables and sides of tents. **S & U** show the pin, ring and button-hole methods and **s** shows how to use a heavy cord with its "needle" dropped through a series of rings or staples to become a fastener.

T shows how to make, and to close, a ventilating-window in an end or side of the tent, also how to attach and fasten strips of canvas.

To erect the Tent-Hospital — Employ a man whose army experience or other knowledge and tact will serve the purpose. Second-hand canvas will answer for a Small-Pox Refuge, as the Tent must be burned as soon as out of use.

To secure dryness — Select dry and moderately elevated ground, and, if not on a rock, dig a trench two feet in depth entirely around the Tent, — within two or three yards from it, — and give it a secure outfall.

* Windows for ventilation are quickly made in the same way as the bed-screens, with unbleached muslin stretched upon frames. Half of the ward-windows, or one-half of every or any window, may thus substitute muslin for glass.

STATE BOARD OF HEALTH OF NEW YORK.

SPECIFICATION OF MATERIAL FOR CONTAGIOUS DISEASE REFUGES

(Prepared by Mr. PRESOTT, sanitary engineer.)

This Specification has reference to the accompanying description and plans of "Contagious Disease Refuges and Temporary Hospitals;" Second Annual Report of the State Board of Health of New York.

PLATE I.

Sills.—The sills of all the buildings shall rest on posts, blocks, or stone piers, shall be accurately level, and at the corners shall be halved and spiked or pinned. The sills of Nos. 1, 2 and 3 shall be made of two 2 by 8 inch joists spiked together, so as to make a sill measuring 4 by 8 inches. The sills of Nos. 4 and 5 shall be made of two 2 by 4 inch joists spiked together, so as to make a sill measuring 4 by 4 inches.

Plates and Corner Posts.—The plates and corner posts for all the buildings shall be made of two 2 by 4 inch joists spiked together, so as to make a single piece measuring 4 by 4 inches.

If timber measuring 4 by 8 inches and 4 by 4 inches be at hand it may be used in lieu of the combination-pieces here described.

Floor Beams.—The floor beams for all buildings shall be of 2 by 8 inch stuff, and placed two feet apart and properly braced.

Rafters and Studding.—The rafters and studding for all buildings shall be of 2 by 4 inch stuff, placed not more than 2 feet 6 inches apart.

Floors.—The floors of all the buildings except Nos. 4 and 5 shall be of two thicknesses of 1½ inch "cull boards;" the under flooring may be of second or third quality "culls," and the top flooring must be of first quality "culls." The floors must be eighteen inches, as nearly as possible, from the ground.

Siding.—The siding shall be "Novelty siding," if it can be obtained, and otherwise of clap-boarding; using culls if economy require. In Nos. 1, 2 and 3 (engraved plans) tarred paper should first be nailed to the studding, and the siding put on outside of this.

Roofs.—The roofs to be covered with shingles, if obtainable, otherwise of boards and battens. If battens are used they should be not over 3 inches wide, and laid in paint-skins.

Doors.—Battened doors will be required, as shown in drawings [or any ready-made doors in market]. Doors to storerooms in No. 3 require locks; other doors may be provided with a simple latch.

Windows.—Windows will conform to the dimensions given, as closely as the supply in the market will afford. In No. 1, all 8 by 5 feet. In No. 2, side and lower ends, 3 by 5 feet; gable 3 by 8 feet 6 inches. In No. 3, all 8 by 5 feet. In No. 4, 8 by 8 feet, placed as high as possible. In No. 5, 1 by 2 feet. The lower sash in each window of No. 1 may be covered with muslin or sheeting, and not glazed. Any window may be thus treated. The long gable-windows in No. 2 are to swing on a horizontal axis at the center, the bottom swinging outward.

Partitions.—The partitions in No. 3 are to be of a single thickness of one-half or three-quarter inch ceiling boards, tongued and grooved.

Screens or Movable Partitions.—There will be required six screens or movable partitions, each consisting of a stout frame 11 feet long and 6 feet high, resting on a cross-piece or "foot" at each end; said foot to be 2 feet long, 6 inches wide and 2 inches thick. The frame to be covered with unbleached sheeting.

THE FOLLOWING TABLE SHOWS THE QUANTITIES OF MATERIALS NEEDED FOR THE CONSTRUCTION OF THE SEVERAL BUILDINGS.

No. 1. — TEMPORARY AND CONVALESCENT WARD.

Sills, 2x8 in. (doubled) 136 ft.	Siding (Novelty), 740 sq. ft.; or clap-boards 1,110 square feet.
Plates, 2x4 in. (doubled) 136 ft.	Tarred paper, 740 sq. ft.
Corners, 2x4 in. (doubled) 104 ft.	Roofing boards, 242 square feet.
Floor beams, 2x8 in., 110 ft.	Shingles, 1½ thousand.
Studding, 2x4 inches, 236 feet.	Corner boards, etc., 1x5 inches, 168 feet.
Rafters, 2x4 inches, 110 feet.	Windows, 5, 3x5 feet.
Flooring, common culls, 1½ in., 220 sq. ft.	Door, 1, 3x7 feet (as near as may be).
Flooring, first quality culls, 1½ in., 220 sq. ft.	

No. 2. — SICK WARD.

Sills, 2x8 inches (doubled), 208 ft.	Siding (Novelty), 1,374 sq. ft.; or clap-boards, 2,061 sq. ft.
Plates, 2x4 inches (doubled), 208 ft.	Tarred paper, 1,374 square feet.
Corners, 2x4 in. (doubled) 104 ft.	Roofing boards, 960 square feet.
Bearing beam, 2x8 in. (doubled), 60 ft.	Shingles, 7 thousand.
Floor beams, 2x8 inches, 308 feet.	Corner boards, etc., 1x5 in., 270 square feet.
Studding, 2x4 inches, 494 feet.	Windows, 8, 3x7 feet; 2 swing, 3x8 feet 6 inches.
Rafters, 2x4 inches, 384 feet.	Doors, 2, 3x7 feet.
Flooring, common culls, 1½ in., 660 sq. feet.	
Flooring, first quality culls, 1½ in., 660 sq. ft.	

No. 3. — ADMINISTRATION BUILDING.

Sills, 2x8 inches (doubled), 220 ft.	Siding (Novelty), 1,268 ft.; or clap-boards, 1,908 square feet.
Plates, 2x4 inches (doubled), 220 ft.	Tarred paper, 1,268 feet.
Corners, 2x4 in. (doubled), 104 ft.	Roofing boards, 770 square feet.
Bearing beam, 2x8 in. (doubled), 70 ft.	Shingles, 5½ thousand.
Flooring beams, 2x8 inches, 340 feet.	Corner boards, etc., 1x5 in., 214 feet.
Studding, 2x4 inches, 611 feet.	Partitions, ½ in., tongued & grooved, 915 sq. ft.
Rafters, 2x4 inches, 308 feet.	Windows, 8, 3x5 feet.
Flooring, common culls, 1½ in., 700 sq. ft.	Doors, 2, 3x7 ft.; 5, 2½x6 ft.
Flooring, first quality culls, 1½ in., 700 sq. ft.	

No. 4. — DEAD-HOUSE AND DISINFECTING ROOM.

Sills, 2x4 inches (doubled), 104 ft.	Siding (Novelty), 676 sq. ft.; or clap-boards, 1,014 square feet.
Plates, 2x4 inches (doubled), 104 ft.	Roofing boards, 162 square feet.
Corners, 2x4 in. (doubled), 104 ft.	Shingles, 1½ thousand.
Floor beams, 2x8 inches, 64 feet.	Corner boards, etc., 1x5 in., 156 feet.
Studding, 2x4 inches, 247 feet.	Partition, ½ inch, ceiling, 89 square feet
Rafters, 2x4 inches, 63 feet.	Window, 1, 3x3 feet.
Flooring, common culls, 1½ in., 144 sq. ft.	Doors, 1, 3x7 feet; 1, 2½x6 ft.

No. 5. — PRIVY.

Sills, 2x4 inches (doubled), 36 ft.	Shingles, ½ thousand.
Floor beams, 2x4 inches, 12 feet.	Siding (Novelty), 144 sq. ft.; or clap-boards, 216 square feet.
Studding, 2x4 inches, 64 feet.	Corner boards, etc., 1x5 in., 48 feet.
Flooring, common culls, 1½ in., 27 square ft.	Window, 1, 3 feet x 1 foot.
Seat, etc., first quality culls, 1½ in., 16 sq. ft.	Door, 1, 2 feet 6 inches x 6 feet.
Roofing boards, 88 square feet.	
Rafters, 2x4 inch, 24 feet.	

SUMMARY (FOR ALL STRUCTURES IN PLATE I).

2x8 inches, 1,516 feet.
 2x4 inches, 3,867 feet.
 Common cull boards, 1,758 square feet.
 First quality cull boards, 1,666 square feet.
 } Novelty siding, 4,204 square feet;
 } or clap-boards, 6,306 square feet.
 Tarred paper, 510 pounds.
 Roofing boards, 2,170 square feet.
 Shingles, 16½ thousand.
 Corner boards, etc., 1x5 inches, 856 feet.
 Windows, 3x5 feet, 13.
 Windows, 3x7 feet, 8.
 Doors, 3x7 feet, 7.
 Doors, 2 feet 6 inches x 6 feet, 7.
 ½ inch ceiling (for partitions), 1,004 sq. ft.
 Nails and brads (estimated), pounds.

In addition, there will be required for No. 2 a ridge ventilator, as shown in the drawings. It may be three feet long, two feet wide and two feet high. It will be provided with a swinging-shutter on each side, made as large as possible, the bottom swinging outward.

STATE BOARD OF HEALTH OF NEW YORK.

ORGANIZATION, POWERS AND DUTIES OF LOCAL BOARDS OF HEALTH.

The State Board of Health invites the attention of Local Boards of Health in Towns, Villages and Cities to this recently amended statute, defining the powers and duties of Local Sanitary Officers.

AN ACT for the Preservation of the Public Health.

[The amendment in 1881, chapter 431, Session Laws, is here printed in *italics*. The words in black letters have been added by the amendments made in chapter 351 — of 1882. The other portion, in common type, comprises what remains of the original act of 1850.]

§ 1. It shall be the duty of the common council of every city in this state, except in the cities of Brooklyn, New York, Yonkers and Buffalo, which are hereby excepted from the operation of this act, to appoint a board of health for such city to consist of six persons who are not members of said council, and who shall be appointed as follows: Two persons for a term of one year; two persons for a term of two years; and two persons for a term of three years; (one of whom, at least, shall be a competent physician). The mayor of such city shall be a member *ex-officio* of such board of health, and shall be president thereof. The said board of health, when duly organized, shall appoint a competent physician (not a member of such board) who shall be health officer for such city. This section shall not be construed to remove any of the existing boards of health in any of the cities of this state, but the successors of such boards shall be appointed as in this section provided. Upon the expiration of the term of office of any member of the board of health, appointed as herein provided, his successor shall be appointed by such common council for the term of three years, and the said common council shall also have power to fill any vacancy caused in such board of health by the death, resignation or removal from the city of any member thereof. And it shall be the duty of the trustees of every incorporated village in this state in which there is not now a board of health duly organized, to appoint once in each year a board of health for such village, to consist of not less than three nor more than seven persons (who are not village trustees), who shall hold office for one year, or until their successors shall have been appointed, from which board shall be elected a president and secretary; and the said board of health thus constituted shall appoint a competent physician to be the health officer of such village, who shall not be a member of said board of health.

§ 2. The supervisor and justices of the peace and the town clerk, or a majority of them, of each town in this state, together with a citizen of such town, of full age to be elected by them, shall be the board of health for such town for each year, and they shall appoint some competent physician not a member of said board, to be the health officer for such town. They shall have cognizance of the causes of injury or danger to the public health, and shall meet upon call of the supervisor. Also, whenever in the judgment of the state board of health, or (if the said board be not in session), of the president and secretary thereof, it shall be necessary, and the public good requires it, the supervisor of such town upon reasonable notice being given him from the state board of health, or its president and secretary, shall immediately convene the town board of health, by notice to the members thereof, to take such proceedings as the public health in that vicinity may require, and concerning which it shall have been notified by the state board of health, or by its president and secretary. And in any case in which the term for which the board of health of any village or city heretofore appointed shall have expired, or in any case in which a member or several members of a board of health of any town, village or city in this state, shall resign or cease to act officially, so that less than the statutory number of members of said board continue to be members thereof, then it shall be the duty of the county judge of the county in which such town, village or city is situated, or of an adjacent county upon being satisfied that such term has expired or that such vacancy or vacancies exist, to appoint in writing a competent citizen or citizens, as the case shall require to fill such vacancy or vacancies, and to perform the duties of said office within the time specified, and until the said town, village or municipal government shall have elected

or appointed the member or members, who shall, according to law, perform such official duties in the said board of health. The written appointment to a board of health, made by a county judge under this section shall forthwith be filed in the office of the clerk of the county in which said board of health is located. Any violation of the provisions of this section or of any lawful instruction of said state board of health shall be a misdemeanor.

§ 3. The several boards of health now organized in any city, village or town in this state (except in the cities of New York and Brooklyn), and the several boards of health constituted under this act as amended, shall have power and it shall be their duty:

(1.) To meet in their respective cities, villages and towns and fix and determine the period of quarantine to which vessels, vehicles or persons arriving in such city, village or town shall be subject; but the said board shall have power, after an examination, to reduce the period of quarantine of such vessel, vehicles or persons, if they deem it safe to do so.

(2.) To prescribe the duties and powers of the local health officer; to direct him from time to time in the performance thereof, and to fix the compensation he shall receive.

(3.) To make orders and regulations in their discretion concerning the place and mode of quarantine, the examination and purification of vessels, boats and other craft not under quarantine; the treatment of vessels, articles or persons thereof; the regulation of intercourse with infected places; the apprehension, separation and treatment of emigrants and other persons who shall have been exposed to any infectious or contagious disease; the suppression and removal of nuisances, and all such other orders and regulations as they shall think necessary and proper for the preservation of the public health; also to enter upon or within any place or premises where conditions dangerous to the public health are known or believed to exist and by appointed members or persons to inspect and examine the same, for the protection of life and health, and for no other purpose, and all owners, agents and occupants shall permit such sanitary examinations; and it shall be the duty of said board of health to furnish said owners or occupants a written statement of results or conclusions of such examinations.

(4.) To regulate and prohibit or prevent all communication or intercourse with all houses, tenements and places, and the persons occupying the same, in which there shall be any person who shall have been exposed to any infectious or contagious disease.

(5.) Such board of health shall have power, and it shall be its duty, to receive and examine into the nature of complaints made by any of the inhabitants, concerning causes of danger, or injury to the public health within the limits of its jurisdiction; also to report to the state board of health, promptly, facts which relate to infectious and epidemic diseases within said jurisdiction, and to require such isolation and quarantining of persons, vessels and sources of infection, as shall be in its judgment necessary; also to release from such isolation or quarantine, such persons, vessels and things, as it shall deem safe so to release; but upon ordering such quarantining or isolation, or such release from the same, said board and its health officers shall make a record of the facts in the case, and of the reasons for the action taken. It shall also be the duty of the said local board to procure suitable places for the reception of persons, and things infected with malignant, contagious or infectious diseases, and in all cases where sick persons cannot otherwise be provided for, to procure for them medical, and other attendance and necessities; and it

shall be the duty of every such board of health to take cognizance of, and report, every case of small-pox or varioloid, occurring within said board's jurisdiction, also to make all needful provisions for immediately obtaining the necessary means for thorough and safe vaccination of all persons within the said jurisdiction who may need the same. It shall also be the duty of the board of health in each town, village and city in

this state, to have the supervision of the registration of deaths, diseases and the causes of death, and by its appointed officers, to examine all certificates and records of death, and findings of coroner's juries, and to designate the persons who shall grant permits for the burial of the dead, and to prescribe sanitary regulations for

such burials; and there shall be no burial of any dead person until a certificate of the death and its causes, if known, shall have been made and presented as required by the laws of this state, and until thereupon a permit for burial shall have been given as provided by said laws; and it shall be the duty of every such board of health to supervise and make complete the registration of births, deaths and marriages within the limits of its jurisdiction, and in so completing the said registration the cost thereof shall be a charge upon such town, village or city, and shall not exceed fifty cents for each completely verified and registered record of a birth, death or marriage, but the town clerks and the registering clerks provided by law in villages and cities may still keep all records of births, deaths and marriages as required by chapter five hundred and twelve, laws of eighteen hundred and eighty; and in any place in this state in which the state board of health ascertains that said registration is not completely and well made, said state board shall notify the local board of health and the registering clerk, whose duty it is to make the registration in such place, that within three months from the date of such notice, said defects and neglect in the records must be amended and prevented. If at the expiration of the time mentioned said neglect and defects are not overcome and prevented by said local authorities, it shall be the duty of the state board of health to take such control of, and adopt such means for causing compliance with rules and regulations for the said records, as will secure their completeness and proper registration within the limit of cost hereinbefore specified, and until the said local officers shall agree to and actually make the said records and registry complete as required by law; any refusal or willful neglect on the part of any person whose duty it is to make out or file for registration any record or records as aforesaid, and any officer or board that shall neglect or refuse to register and preserve said records as required by law, shall be deemed guilty of a misdemeanor, and may be prosecuted in any court of competent jurisdiction.

State board shall take control to remedy neglects and enforce compliance for a time.

(6.) To publish from time to time all such orders and regulations of general obligation as they shall have made, in such manner as to secure early and full publicity thereto; and to make, without publication thereof, such orders and regulations in special or individual cases, not of general application, as they may see fit, concerning the suppression and removal of nuisances, and concerning all other matters in their judgment detrimental to the public health, and to serve copies thereof upon any occupant or occupants of any premises whereon any such nuisances or other matters aforesaid shall exist, or by posting the same in some conspicuous place on such premises.

Orders and regulations to be published.

(7.) To issue warrants to any constable of their respective cities, villages or towns, to apprehend and remove such persons as cannot otherwise be subjected to the orders and regulations by them adopted; and, whenever it shall be necessary to do so, to issue their warrant to the sheriff of their respective counties to bring to their aid the power of the county; all which warrants shall be forthwith executed by the officers to whom they shall be directed, who shall possess the like powers and be subject to the like duties in the execution thereof, as if the same had been duly issued out of any court of record in this state.

Power to issue warrants.

(8.) To employ all such persons as shall be necessary to enable them to carry into effect the orders or regulations they shall have adopted, published and made, and the powers vested in them by this act, and to fix their compensation.

Employment of agents.

(9.)* To impose penalties for the violation of, or non-compliance with, their orders and regulations, and to maintain actions in any court of competent jurisdiction to collect such penalties, not exceeding one hundred dollars in any one case, or to restrain by injunction such violations, or otherwise to enforce such orders and regulations.

Boards of Health may impose and enforce penalties or restrain violations by injunctions.

* Added by § 1, chapter 559, Laws of 1870.

Violating or-
ders of Board
a misdemeanor
or; penalty.

§ 4.* Every person who shall willfully violate or refuse to obey any order or regulation so made and published, or any order so made and served, or posted as aforesaid, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall be subject to fine or imprisonment, or both, in the discretion of the court, such fine not to exceed one thousand dollars nor such imprisonment **six months**. And in any case of non-compliance with any order or regulation which shall have been so served or posted, as provided in subdivision six of section three of said act as hereby amended, the said board

Power to
enter upon
premises and
suppress nui-
sance.

or its servants or employees may lawfully enter upon any premises to which such order or regulation relates, and suppress or remove the nuisance or other matters in the judgment of said board detrimental to the public health mentioned in such order or regulation, and any other nuisance or matter of the description aforesaid found there existing; and the expense thereof shall be a charge upon the occupant or any or all the occupants of said premises, and may be sued for and recovered with costs by said board in the name of such board in any court having jurisdiction. Whenever execution upon any judgment so obtained shall have been returned wholly or in part unsatis-

Unsatisfied
judgment to
be a lien upon
the premises.

fied, said judgment, for the amount so unsatisfied, shall be a lien upon said premises, having preference over all other liens or incumbrances whatsoever. But in order to acquire such lien, such judgment, if in a court not of record, shall first have been docketed in the same place and manner as by law now required to make judgments in such courts liens upon real estate. And whenever any lien upon any premises shall have

Sale of prem-
ises at auc-
tion.

become fixed as aforesaid, the said board may cause the said premises to be sold at public auction, for a term of time, for the payment and satisfaction of such lien, and the expenses of such sale, giving notice of such sale for twelve weeks

successively, once in each week, in one or more newspapers, published in the city, incorporated village or town where the premises are situated, as the case may be; or if no newspaper be published in such village or town, then in the newspaper published nearest said premises, and also serving a copy of such notice of sale personally on the owner or agent of said premises, if known, and a resident of said city, village or town, at least fourteen days previous to such sale, or by depositing the same in the post-office, directed to such owner or agent at his place of residence, if known, or the nearest post-office thereto, at least twenty-eight days previous to such sale. And the said premises shall be sold to the person who shall offer to take the same for the shortest time, paying the amount remain-

Certificate of
sale.

ing unpaid upon such judgment, with interest, and the expenses of such notice and sale. A certificate of such sale, signed by the president and countersigned by the secretary of such board shall thereupon be made and delivered to the purchaser, and may be recorded in like manner and with like effect as deeds of conveyance of lands, and thereupon the purchaser, his heirs or assigns, shall be entitled to the possession of said premises so sold as aforesaid, and if unoccupied may immediately enter, and if occupied may have remedy against any occupant by action or by summary proceedings, as against a tenant holding over after expiration of his term; and in case the costs of such action or proceeding shall not be collected by such purchaser of the defendant therein, the same shall be a lien upon said premises, having the like preference as the lien aforesaid, and the term of the said purchaser shall be extended during a time bearing the same proportion to the original term as the amount of such cost bears to the amount paid by such purchaser on such sale. And such term shall commence when such purchaser shall have acquired possession. At any time after such sale, and within six months after the recording of such certificate as aforesaid, the owner or any lienor or incumbrancer of such premises, or of any part thereof, may redeem by paying to the purchaser the amount paid by him on such sale, and all costs and expenses he may have incurred in any action or proceeding as aforesaid to obtain possession, with ten per cent interest thereon. If such redemption be made by the owner, the right of the purchaser shall be extinguished; and if such lienor or incumbrancer, the amount paid by him to redeem shall be added to his lien or incumbrance, or if he have more than one, to the oldest, and shall thenceforth partake of the nature thereof and be collectible by any remedy adapted thereto.

* As amended by chapter 790, Laws of 1867. Only when the regulation has been made and published can conviction be had for its violation. *Reed v. People, 1 Park, Cr. R. p. 481.*

§ 5.* All expenses incurred by the several boards of health under their official orders or regulations, or under requirements of the statutes, in the execution and performance of the duties imposed by this act shall be a charge only on their respective cities, villages and towns; and shall be audited levied, collected and paid in the same manner as other city, village and town charges are audited, levied, collected and paid.

Expenses of Boards of Health to be a town, village or city charge; how audited and paid.

§ 6. Whenever any pestilential, or infectious or contagious disease shall exist in any county poor-house in this State, or in the vicinity of any such county poor-house, and the physician of such county poor-house shall certify that such pestilence or disease is likely to endanger the health of the persons supported at such poor-house, the superintendent of such county poor-house shall have power to cause the person supported at such poor-house, or any of them, to be removed to such other suitable place in the same county as shall be designated by the board of health of the city, town or village within which such poor-house shall be, there to be maintained and provided for at the expense of the county, with all necessary medical care and attendance, until they shall be safely returned to the county poor-house from which they were taken, or otherwise discharged.

§ 7. *In any instance in which there is a legally organized board of health in an incorporated village, which comprises parts of several towns, or less than a whole town, such board of health shall have full authority in regard to all matters relating to public health within said village, and such village which has its own organized board of health shall not be subject to the sanitary regulations or health officers of the township or towns within which such village is located; nor shall the taxable property of any such village, while maintaining its own board of health be subject to taxation for maintaining any town board or boards of health, or for any expenditures authorized by such town boards; but such expenditures of the town boards of health shall be assessed and collected exclusively on property in the town outside of said village.*

Village Boards and Villages not to be taxed to support town sanitary improvements, nor towns to support Village Boards of Health and their works.

§ 8. All acts and parts of acts inconsistent with this act are hereby repealed.

OTHER STATUTES RELATING TO PUBLIC HEALTH.

Protection against Small-Pox.—Vaccination of School Children.—Chapter 438 of the Laws of 1860, is an *obligatory* law providing for the vaccination of all attendants at the public schools. An abstract and explanation of it are given in No. 41 of the printed Papers of this Board.

Prévention of Adulteration of Food and Drugs.—Chapter 407 of 1881, forbids adulteration of Foods and Drugs. The State Board of Health is required to conduct analytical investigations, and give practical effect to this statute.

Safety-Testing and fixed Standards to prevent dangerous use of Explosive Illuminating Oils.—By Chapter 292 of the Laws of 1882 the use of Petroleum products which give off an explosive vapor at a temperature below 100° Fahr., as tested by methods and instruments approved and directed by the State Board of Health, is prohibited. The State Board is charged with the administration of this statute.

Adulteration and Deception in regard to Milk as sold to Customers.—By Chapters 544 of 1864, 220 of 1878, and 407 of 1881, every kind and mode of adulteration and deception in Milk is prohibited. Local boards of health, as well as persons aggrieved or cognizant, may bring action in court to secure infliction of penalties.

To provide for Public Drainage of Swamps and Wet Lands for Protection of the Public Health.—Chapters 888 of 1869, 303 of 1871, and 243 of 1873, provide ways and means for securing public drainage wherever public health and a Commission judicially appointed demand such general drainage works.

The organic Act creating the State Board of Health and defining the powers of the Governor and the Board.—Chapters 322 of 1880 and 308 of 1882.

*As amended by chapter 781, Laws of 1868, and chapter 351 of 1882.

AN ACT TO ESTABLISH A STATE BOARD OF HEALTH.

CHAPTER 322, LAWS OF 1880.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

State Board of Health, how constituted. SECTION 1. Within twenty days after the passage of this act the governor shall appoint, by and with the advice and consent of the senate, three State commissioners of health, two of whom shall be graduates of legally constituted medical colleges and of not less than seven years' practice of their profession. The said commissioners, together with the attorney-general, the superintendent of the State survey and the health officer of the port of New York, who shall be ex-officio members of the State Board of Health, and three other persons to be designated and appointed by the governor, one of whom shall be a commissioner of health of the Board of Health, of the city of New York, and the others shall be members or commissioners of health of regularly constituted and organized Boards of Health of cities of the State, shall constitute the Board of Health of the State of New York. Nothing in chapter three hundred and thirty-five of the laws of eighteen hundred and seventy-three of the State of New York or in the laws amending the same, or in the laws constituting Boards of Health in the various cities of the State, shall be read or construed to prevent the appointment of the said commissioners of Board of Health of cities also members of the Board of Health of the State of New York, and no appointment to an office, or acceptance thereof under this law, shall be held to vacate the office previously held in any Board of Health of any city in the State.

Oath of commissioners. § 2. The said three commissioners so appointed shall take the oath of office prescribed by the constitution for State officers, and receive from the secretary of State certificates of their appointment. They shall hold office for three years, and whenever a vacancy occurs, the place shall be filled as in other cases provided by law, and the other commissioners shall, from time to time, be designated by the governor as occasion may require, or as their places may be vacated in the Board by the expiration of the several terms of office.

Term of office. § 3. The State Board of Health shall meet at least once in every three months and as much oftener as they shall deem necessary, their first meeting being held in the city of Albany within two weeks after the appointment duly made of the members of the first Board and after they shall have qualified as aforesaid, and each annual meeting shall be held within two weeks after the first of May each year after the first as herein provided. No member of the Board except the secretary shall receive any compensation, but the actual traveling and other expenses of the members and officers of said Board while engaged in their duties shall be allowed and paid out of the appropriation made for its support. They

Vacancies, how filled.

Meetings of board.

Traveling expenses, etc., of commissioners to be paid.

shall elect annually one member of the Board to be president; they shall also elect from among their own members or otherwise, a person of skill and experience in public health duties and sanitary science, to be the secretary and executive officer of said Board, who shall have all the powers and privileges of a member of the Board except in regard to voting upon matters relating to his own office and duties as secretary, and he shall hold said office for the term of three years, but he may be removed for cause after a full hearing by the Board, a majority of the members voting therefor.

President to be annually elected.

Secretary to be executive officer, and to hold office three years.

§ 4. The State Board of Health may adopt by-laws regulating the transaction of its business, and provide therein for the appointment of committees to whom it shall delegate authority and power for the work committed to them, and it may also adopt and use an official seal. Five members shall constitute a quorum for the transaction of business.

Board may adopt by-laws. Seal. Quorum.

§ 5. The secretary shall keep a record of the acts and proceedings of the Board, perform and superintend the work prescribed in this act, and such other duties as the Board may order, and shall receive an annual salary of three thousand dollars, which shall be paid him in the same manner as the salaries of other State officers are paid, and such necessary expenses shall be allowed him as the comptroller shall audit on the presentation of an itemized account having vouchers annexed, together with the certificate of the Board.

Duties and compensation of secretary.

§ 6. Said Board shall take cognizance of the interests of health and life among the people of the State, they shall make inquiries in respect to the causes of disease, and especially of epidemics, and investigate the sources of mortality, and the effects of localities, employments and other conditions upon the public health. It shall be the duty of said Board to obtain, collect and preserve such information relating to deaths, diseases and health as may be useful in the discharge of its duties, and contribute to the promotion of the health or the security of life in the State of New York. And it shall be the duty of all health officers and Boards of Health in the State to communicate to said State Board of Health copies of all their reports and publications; also such sanitary information as may be useful.

General duties of Board.

§ 7. It shall be the duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages and deaths, and also the registration of prevalent diseases. Said Board shall prepare the necessary methods and forms for obtaining and preserving such records, and to insure the faithful registration of the same in the several counties, and in the central bureau of vital statistics at the capitol of the State. The said Board of Health shall recommend such forms and amendments of law as shall be deemed to be necessary for the thorough organization and efficiency of the registration of vital statistics throughout the State. The secretary of said Board of Health shall be the superintendent of registration of vital statistics of the State. As supervised by the said Board, the clerical duties and safe keeping of the bureau of vital statistics thus created shall be provided for by the comptroller of the State, who shall also provide and furnish such apartments and stationery as said Board shall require in the dis-

Board to have supervision of vital statistics of State, and to recommend necessary legislation.

Board to prepare forms for, and regulate use of, transfer permits. charge of its duties. And the State Board of Health shall also prepare the necessary methods and forms and prescribe the rules regulating the issue and use of transfer permits, with the proper coupons attached thereto, to be issued by local organized Boards of Health, for the transportation of the dead bodies of persons which are to be carried for burial beyond the limits of the county where the death occurs; and in all cases, the State Board of Health shall require coupons to be attached to such permits, to be detached and preserved by every common carrier, or the person in charge of any vessel, said railroad train or vehicle to whom such bodies shall be delivered for transportation. Any violation of such rules and regulations shall be a misdemeanor.

§ 8*. At any time the governor of the State may require the State Board of Health to examine into nuisances affecting the security of life and health in any locality, and in such cases, said Board of Health shall have all necessary powers, to make such examinations, and it shall report the results thereof to the governor, within the limits of time prescribed for such examination and report. The report of such examination, when approved by the governor, shall be filed in the office of the secretary of State, and the governor may, in relation to things found and certified by the said Board of Health to be nuisances, declare them to be public nuisances, and order them to be changed, as he shall direct, or abated and removed. And such order shall be presumptive evidence of the existence of such nuisance, and all persons maintaining, or assisting to maintain, or aiding and abetting, in any manner, in the maintenance of such nuisance, after notice of such order, shall be guilty of a misdemeanor, punishable by fine not to exceed one thousand dollars, or imprisonment in the county jail of the county in which such nuisance is maintained, not to exceed one year, or by both such fine and imprisonment. In such cases, when such order has been made, the governor may, by his further order in writing, certified under his official seal, require the district attorney, the sheriff, and the other officers of every such county to take all necessary measures to execute and to obey the order of the governor; and any act of any such county officers in the abatement of any such nuisance, so declared, which shall be reasonable or necessary for the execution of such purpose, shall be lawful and justifiable, and the order of the governor shall be their protection. The expense of the abatement of such nuisance shall be paid by the county in which such nuisance occurs, and such expense shall be a charge or a lien upon the lands maintaining such nuisance, and shall be a valid claim on behalf of said county against all persons maintaining the same, or assisting in the maintenance thereof; and the lien and claim thus created may be collected by action to recover against either or all of the persons liable to pay the same, and may also be enforced by action to enforce the lien upon the lands maintaining the nuisance, by a sale thereof, to satisfy the same.

*As amended by chapter 308, Session Laws of 1882.

§ 9. At any time at the request of the State Board of Health, or whenever the governor shall, as hereinbefore provided, have directed an examination and report to be made by the State Board of Health into any alleged nuisance, any Board of Health of any city of the State may appoint and select any one of its officers as its representative, during such examination of any nuisance, and such representative officer shall have a seat at, and be entitled to take part in, all the deliberations of the State Board of Health, during such investigation, but without the right to vote.

When local Boards to be represented at deliberations of State Boards.

§ 10. Said Board may, from time to time, engage suitable persons to render sanitary service, and to make or supervise practical and scientific investigations and examinations requiring expert skill, and to prepare plans and report relative thereto. And it is hereby made the duty of all officers and agents having the control, charge or custody of any public structure, work, ground or erection, or of any plan, description, outlines, drawings or chart thereof, or relating thereto, made, kept or controlled under any public authority, to permit and facilitate the examination and inspection, and the making of copies of the same by any officer or person by said Board authorized; and the members of said Board, and such other officer or person as may at any time be by said Board authorized, may, without fee or hindrance, enter, examine and survey all grounds, erections, vehicles, structures, apartments, buildings and places. But no more than five thousand dollars in any one year shall be expended for such special sanitary service.

Board may employ experts and examine structures and places.

§ 11. It shall be the duty of said Board, on or before the first Monday of December in each year, to make a report in writing to the governor of the State, upon the vital statistics and the sanitary condition and prospects of the State; and such report shall set forth the action of said Board and of its officers and agents, and the names thereof, for the past year, and may contain other useful information, and shall suggest any further legislative action or precautions deemed proper for the better protection of life and health. And the annual report of said Board shall also contain a detailed statement of the comptroller of all money paid out by or on account of said Board, and a detailed statement of the manner of its expenditures, during the year last past, but its total expenditures shall not exceed the sum of fifteen thousand dollars in any one year.

Limitation of amount to be expended for expert service.

Time of annual report.

§ 12. The sum of fifteen thousand dollars is hereby appropriated from the general fund for the purposes of this act, and the expenditures properly incurred by authority of said Board and verified by affidavit, subject, however, to the limitations hereinbefore imposed, and shall be paid by the treasurer upon the warrant of the comptroller.

Appropriation for expenses.

§ 13. This act shall take effect immediately.

REPORTS BY THE SANITARY COMMITTEE.

The Sanitary Committee of which Prof. C. F. Chandler, Ph. D., LL. D., is chairman, having the special supervision of chemical or other laboratory examinations, has presented the following reports:

1. *Chemical examination of drinking waters.*
2. *The methods and apparatus for testing inflammable oils.*
3. *The report upon adulterations of food and drugs, as provided by the new law to prevent the adulteration of food and drugs.**

Chemical Examination of Drinking Waters, report by Elwyn Waller, Ph. D., of the School of Mines of Columbia College, New York.

During the first year's experience of the State Board of Health, there was much important evidence obtained concerning fatal results from pollution of common water supplies, chiefly of the domestic well. At the last quarterly meeting of the Board in 1880, its sanitary committee and committee on drainage, sewerage and topography, were requested to act jointly in prosecuting exact researches for the purpose of reporting and preventing sources of pollution of water. A small sum of money was then appropriated for carrying on this work.* At the quarterly meeting of the Board in May, 1881, the chairman of the sanitary committee, reported that it would be desirable to employ two analytical chemists for three months during the summer, upon the analyses of waters suspected of dangerous pollution. The Board voted the amount estimated to be necessary, and Prof. Chandler, as chairman of that committee, immediately organized the proposed work.

The results thus obtained are presented in the annexed report by Elwyn Waller, Ph. D., who had responsible supervision of the analyses.

E. H., *Secretary.*

DR. WALLER'S REPORT OF WATER ANALYSIS.

TOTAL SOLIDS.

The earliest method of gaining some information regarding a sample of water consisted in evaporating a measured quantity to dryness to determine the proportion of substances both mineral and organic, contained in the water. The test is still used, as affording information of a kind not to be disregarded in investigating the quality of a water. In his book on water analysis, Wanklyn (water analysis 4th London Ed. 1876, p. 3) says: "In addition to being injurious by reason of organic impurity, water may also be injurious on account of its mineral constituents. These latter may be too excessive in amount, as in the notorious

*See pp. 93 and 152-153, First Ann. Rep., State Board of Health, N. Y.

*The Board has ordered that the report under the "Food and Drug law," shall be separately submitted to the legislature, as it constitutes a volume upon a special subject, and under a new statute.

instance of sea-water, or they may be poisonous in themselves. An examination of potable water should therefore include a determination of the amount of inorganic solids, in the water as well as a testing for poisonous metals."

In these investigations mineral waters, having a medicinal value are of course not considered.

Descriptive List of Samples.

Sample marked.		Date Received.	Information regarding the sample.	From.
Rome,	No. 1.	July 25th.	Inside driven well, Academy basement.	A. O. Kes-singer.
do	No. 2.	do	Outside dug well, roofed over, wooden pump, Liberty street school.	"
do	No. 3.	do	Inside driven well, Thomas street school basement.	"
do	No. 4.	do	City water (Mohawk and Black rivers).	"
do	No. 5.	do	Inside driven well, James street school basement.	"
Watertown,	No. 1.	do	Delano's Falls, 2 miles above the city.	J. M. Adams.
do	No. 2.	do	From old supply, forced into mains by pumps.	"
do	No. 3.	do	Well water.	"
West Troy,	No. 1.	Aug. 9th.	By dam near outlet chimney.	Dr. R. H. Sabin,
do	No. 2.	do	Back of the slaughter-house.	Health
do	No. 3.	do	From drinking fountain in the vil-lage.	Officer.
do	No. 4.	do	Inlet of reservoir from Mohawk river.	"
Southampton, L. L.,	No. 5.	do	Well of No. 5. State Board of Health report, p. 152.	Dr. P. Bryn-berg Porter,
do	No. 7.	do	Well of No. 7. State Board of Health report, p. 152.	"
do	No. 9.	do	Well of No. 9. State Board of Health report, p. 152.	"
do	No. 10.	Aug. 18th.	Well of No. 10. State Board of Health report, p. 152.	"
do	"Lee"	do		
do	No. 4.	Aug. 16th.	Well of No. 4. State Board of Health report, p. 152.	"
do	X	Sept. 6th.	Drive well on the beach.	"
do	XX	do	Well of Mr. J. H. Piessm.	"
do	XXX	do	Well of Mr. W. Pithtnau.	"
Batavia,	No. 1.	Sept. 15th.	From 62 State street.	Dr. C. Houghton,
do	No. 2.	do	From 27 Ellicott street.	"
do	No. 3.	do	From Ross street.	"
West Hampton,	No. 1.	do	From well of Mr. Delafeld.	C. F. Chand-ler, Ph. D.
do	No. 2.	do	From well of Mr. C. F. Chandler.	"
do	No. 3.	Sept. 27th.	From well of Mr. Dix.	"
Schaghticoke,	No. 1.	Sept. 17th.	Well in lower part of the village (30 feet depth).	Dr. Crom-bie.
do	No. 2.	do	Well in upper part of the village	"
Lockport,	No. 1.	Sept. 24th.	Canal, above locks, nearly outside city limits.	Dr. W. J. Ransom,
do	No. 2.	do	Union school well.	"
do	No. 3.	do	Well East Lockport (or lower town).	"
Cortland village,	No. 1.	Sept. 29th.	Well.	Dr. F. Hyde.
do	No. 2.	do	Well (much sickness in the neigh-borhood).	"
Cazenovia,	No. 1.	Oct. 24th.	Well much used in village.	Dr. J. N. Goff.
do	No. 2.	Oct. 22d.	do do do	"
Hamilton,	No. 1.	Nov. 15th.	From drive well used in bread and cracker baking by a hotel (privy 30 feet off). Another privy 30 feet off. Cess-pool 24 feet off.	Dr. F. D. Beebe.
do	No. 2.	do	Dug well, public school, 30 feet deep (66 feet from privy).	"
Croton Falls,	No. 1.	Nov. 23d.	O'Neil well.	Dr. J. E. Wood.
do	No. 2.	do	Michael Wood's well.	"
do	No. 3.	do	R. Smith's well.	"

Conclusions According to Standards of

Sample.	Wauklyn.	Tidy.	Elis.	Sec. Pub. Anal.	Remarks.
Rome,	No. 1. Good.	Good.	Good.	Good.	
do	No. 2. Good.	Good.	D'tbf'l.	Good.	Suspicion of previous sewage contamination.
do	No. 3. Good.	Good.	Good.	Good.	
do	No. 4. Good.	Bad.	Good.	Unsat.	Probable vegetable contamination.
do	No. 5. Bad.	D'tbf'l.	Unsat.	do	Suspicion of recent sewage contamination.
Watertown,	No. 1. Fair.	Bad.	do	Bad.	Probable vegetable contamination.
do	No. 2. Fair.	do	do	Bad.	do do do
do	No. 3. Good.	Good.	Good.	Good.	
West Troy,	No. 1. Bad.	Bad.	Bad.	Bad.	Probable animal contamination.
do	No. 2. Bad.	Bad.	Bad.	Bad.	do do do
do	No. 3. Bad.	Bad.	Bad.	Bad.	do do do
do	No. 4. Fair.	Unsat.	Unsat.	Unsat.	
Southampton,	No. 5. Bad.	Unsat.	Bad.	do	Infiltration of sewage probable.
do	No. 7. Bad.	do	do	Fair.	do do do
do	No. 9. Bad.	do	do	Unsat.	do do do
do	No. 10. Good.	Good.	Good.	Good.	
do	"Lee" Good.	Good.	Good.	Good.	
do	No. 4. Fair.	Good.	Fair.	Good.	
do	X D'tbf'l.	Unsat.	D'tbf'l.	Bad.	Recent sewage probably present.
do	XX Bad.	Fair.	Bad.	Bad.	do do do do
do	XXX Bad.	D'tbf'l.	Bad.	Bad.	Sewage probably present.
Batavia,	No. 1. Good.	Good.	Fair.	Good.	
do	No. 2. Unsat.	Fair.	Unsat.	Bad.	Solids objectionable, suspicious.
do	No. 3. Bad.	Bad.	Bad.	Bad.	
West Hampton,	No. 1. Fair.	Unsat.	Fair.	Good.	
do	No. 2. Fair.	Unsat.	Fair.	Good.	
do	No. 3. Unsat.	Unsat.	Bad.	Unsat.	Slight suspicion of previous sewage contamination.
Schaghticoke,	No. 1. Bad.	Bad.	Bad.	Bad.	
do	No. 2. Unsat.	Fair.	Bad.	Bad.	
Lockport,	No. 1. Bad.	Unsat.	Bad.	Bad.	
do	No. 2. Unsat.	Fair.	Bad.	D'tbf'l.	
do	No. 3. Fair.	Fair.	Fair.	Bad.	Excessively hard.
Cortland village,	No. 1. Good.	Good.	Good.	Good.	
do	No. 2. D'tbf'l.	Bad.	D'tbf'l.	Bad.	Possibly vegetable contamination.
Cazenovia,	No. 1. D'tbf'l.	Bad.	Bad.	Bad.	
do	No. 2. Good.	Good.	Good.	Good.	Turbidity and mineral matter objectionable.
Hamilton,	No. 1. Fair.	Good.	Bad.	Good.	Suspicion of sewage percolation.
do	No. 2. Good.	Good.	Good.	Good.	Hardness objectionable.
Croton Falls,	No. 1. Fair.	Good.	Good.	Good.	
do	No. 2. Good.	Good.	Good.	Good.	
do	No. 3. Good.	Good.	Good.	Good.	

A water is designated *good* when, from what can be learned by the examination or a knowledge of the location of its source, there is no satisfactory ground for condemning it.

As *fair*, when it cannot be considered as first class, but still can probably be used with safety.

As *unsatisfactory*, when the indications are suspicious, and it is advisable only to use it so long as another supply cannot be obtained.

As *doubtful*, when the indications are still more suspicious, and it is deemed advisable to avoid its use.

As *bad*, when it should not be used under any circumstances whatever for household purposes.

NOTES UPON THE CHEMISTRY OF POTABLE WATERS AND THE VALUE
AND SIGNIFICANCE OF THE TESTS AND RESULTS.

To the State Board of Health :

I have the honor to present herewith the results of my examinations of the various samples of water taken from suspected sources of public

ANALYSIS OF WATER.

Results in parts per hundred thousand.

Sample marked.	Appearance — color.	Odor when heated to 100° Fahr.	Chlorine in chlorides.	Equivalent to sodium chloride.	Phosphoric acid in phosphates.	Nitrogen in nitrates & nitrites.	Free ammonia.	Albuminoid ammonia.	Oxygen absorbed at 30° Fahr.	Before boiling.	After boiling.	Organic and volatile matter.	Mineral matter.	Total solids dried at 230° Fahr.	Conclusions.	Analysis number.	
Rome No. 1.....	Clear, light bluish green.....	Slight.....	0.877.....	1.445.....	None.....	0.2525.....	0.0004.....	None.....	None.....	0.0064.....	0.10.....	3.713.....	1.500.....	22.90.....	Good.....	1	
do No. 2.....	do	do	2.245.....	3.699.....	Slight trace.....	0.5771.....	0.0020.....	0.0006.....	0.0016.....	0.20.....	7.668.....	Trace.....	36.60.....	36.60.....	Fair.....	2	
do No. 3.....	do	do	1.333.....	2.196.....	do	0.3376.....	0.0006.....	0.0016.....	0.0016.....	0.40.....	3.934.....	Trace.....	25.30.....	25.30.....	Not completely satisfactory.....	3	
do No. 4.....	Slightly turbid, yellow.....	do	0.140.....	0.231.....	Trace.....	0.0289.....	0.0010.....	0.0074.....	0.0040.....	0.2632.....	7.200.....	6.662.....	8.20.....	8.20.....	8.80.....	Unsatisfactory.....	4
do No. 5.....	Yellowish green.....	Faint.....	6.401.....	8.902.....	do	0.0367.....	0.0004.....	0.0120.....	0.0280.....	0.2039.....	41.300.....	3.800.....	71.00.....	71.00.....	71.80.....	Unsatisfactory.....	5
Watertown No. 1.....	Turbid, brownish.....	do	0.105.....	0.173.....	do	0.0145.....	0.0024.....	0.0050.....	0.0076.....	0.3972.....	6.900.....	6.120.....	6.50.....	6.50.....	7.50.....	Unsatisfactory.....	6
do No. 2.....	Turbid, yellowish brown.....	do	0.033.....	0.057.....	do	0.0235.....	0.0014.....	0.0050.....	0.0121.....	0.3754.....	6.775.....	3.245.....	7.10.....	7.10.....	7.10.....	Unsatisfactory.....	7
do No. 3.....	Clear, light bluish green.....	Slight.....	0.204.....	0.308.....	Heavy trace.....	0.0107.....	0.0020.....	0.0020.....	0.0234.....	13.320.....	3.060.....	Trace.....	37.40.....	37.40.....	37.40.....	Good.....	8
West Troy No. 1.....	Clear, light bluish yellow.....	Of stable.....	0.204.....	0.308.....	do	0.0033.....	0.0050.....	0.0050.....	0.0810.....	2.9012.....	8.400.....	3.600.....	15.10.....	15.10.....	15.60.....	Bad.....	9
do No. 2.....	Turbid, brownish yellow.....	do	0.331.....	0.529.....	do	0.0054.....	0.0150.....	0.0150.....	0.0810.....	2.9012.....	8.400.....	3.600.....	15.10.....	15.10.....	15.60.....	Bad.....	10
do No. 3.....	Turbid, yellow.....	do	0.331.....	0.529.....	do	0.0054.....	0.0150.....	0.0150.....	0.0810.....	2.9012.....	8.400.....	3.600.....	15.10.....	15.10.....	15.60.....	Bad.....	11
do No. 4.....	Turbid, brown.....	do	0.331.....	0.578.....	do	0.0054.....	0.0150.....	0.0150.....	0.0810.....	2.9012.....	8.400.....	3.600.....	15.10.....	15.10.....	15.60.....	Bad.....	12
do No. 5.....	Slightly turbid, yellow.....	do	4.210.....	6.940.....	do	0.0112.....	0.0024.....	0.0024.....	0.0704.....	0.2062.....	8.740.....	4.590.....	16.00.....	16.00.....	16.00.....	Unsatisfactory.....	13
South pton No. 5.....	Clear light blue.....	do	4.900.....	6.940.....	do	0.7450.....	0.0070.....	0.0160.....	0.0269.....	0.1354.....	15.440.....	Trace.....	16.00.....	16.00.....	16.00.....	Do butful.....	14
do No. 6.....	do	do	4.033.....	6.647.....	Trace.....	0.1155.....	0.0085.....	0.0112.....	0.0237.....	0.1374.....	5.840.....	3.820.....	16.90.....	16.90.....	19.70.....	Do butful.....	15
do No. 7.....	Clear light blue.....	do	1.578.....	2.600.....	do	0.2633.....	0.0020.....	0.0022.....	0.0608.....	2.071.....	1.900.....	2.100.....	7.30.....	7.30.....	9.40.....	Good.....	16
do No. 8.....	do	do	4.335.....	6.958.....	do	0.0412.....	None.....	0.0022.....	None.....	0.0016.....	1.485.....	1.396.....	5.70.....	5.70.....	8.40.....	Good.....	17
do No. 9.....	do	do	2.630.....	4.335.....	do	0.2470.....	do	0.0105.....	0.0049.....	0.0163.....	13.675.....	2.574.....	31.50.....	31.50.....	30.50.....	Good.....	18
do No. 10.....	Turbid, yellowish green.....	do	0.243.....	0.368.....	Trace.....	None.....	0.2780.....	0.0030.....	0.0178.....	0.1359.....	27.775.....	27.760.....	137.30.....	137.30.....	136.20.....	Bad.....	19
do No. 11.....	do	do	0.243.....	0.368.....	Trace.....	None.....	0.2780.....	0.0030.....	0.0178.....	0.1359.....	27.775.....	27.760.....	137.30.....	137.30.....	136.20.....	Bad.....	20
do No. 12.....	do	do	4.384.....	6.958.....	Faint trace.....	0.2176.....	0.0090.....	0.0092.....	0.0378.....	0.0935.....	6.712.....	5.742.....	10.10.....	10.10.....	10.10.....	Bad.....	21
do No. 13.....	do	do	0.210.....	0.317.....	Trace.....	0.7016.....	0.0280.....	0.0245.....	0.0090.....	0.178.....	11.088.....	7.329.....	16.00.....	16.00.....	16.00.....	Good.....	22
Batavia No. 1.....	Clear, light green.....	do	0.210.....	0.317.....	Trace.....	0.7016.....	0.0280.....	0.0245.....	0.0090.....	0.178.....	11.088.....	7.329.....	16.00.....	16.00.....	16.00.....	Good.....	23
do No. 2.....	Cloudy, green.....	do	17.900.....	17.900.....	None.....	0.0608.....	0.0060.....	0.0060.....	0.0060.....	None.....	21.274.....	10.350.....	3.80.....	41.10.....	41.10.....	Good.....	24
do No. 3.....	Turbid, red brown.....	Rotten wood.....	18.210.....	18.210.....	Heavy trace.....	1.2300.....	0.0314.....	0.0030.....	0.0301.....	0.9221.....	32.570.....	15.840.....	16.50.....	110.00.....	126.50.....	Unsatisfactory.....	25
W. Hampton No. 1.....	Clear, light blue.....	None.....	2.247.....	3.748.....	Trace.....	0.1120.....	0.0030.....	0.0030.....	0.0030.....	0.0030.....	2.073.....	2.073.....	12.00.....	12.00.....	12.00.....	Bad.....	26
do No. 2.....	Clear, light blue.....	do	3.748.....	3.748.....	Trace.....	0.1120.....	0.0030.....	0.0030.....	0.0030.....	0.0030.....	2.073.....	2.073.....	12.00.....	12.00.....	12.00.....	Bad.....	27
do No. 3.....	Turbid, green.....	do	2.247.....	3.748.....	Trace.....	0.1120.....	0.0030.....	0.0030.....	0.0030.....	0.0030.....	2.073.....	2.073.....	12.00.....	12.00.....	12.00.....	Bad.....	28
Schag coke No. 1.....	Slightly turbid, light blue.....	do	28.230.....	46.530.....	Heavy trace.....	0.6588.....	None.....	0.0142.....	0.0246.....	0.1182.....	11.210.....	10.630.....	4.50.....	44.60.....	47.00.....	Unsatisfactory.....	29
do No. 2.....	Turbid, yellow.....	do	7.628.....	12.570.....	Heavy trace.....	0.6210.....	0.0105.....	0.0355.....	0.0440.....	0.2110.....	10.100.....	32.670.....	8.00.....	138.50.....	146.50.....	Bad.....	30
Lockport No. 1.....	Faintly turbid, light blue.....	Faint.....	8.907.....	1.529.....	Slight trace.....	1.257.....	0.0135.....	0.0036.....	0.0210.....	0.0900.....	35.144.....	23.25.....	12.00.....	118.30.....	130.20.....	Do butful.....	31
do No. 2.....	Faintly turbid, light blue.....	do	8.907.....	1.529.....	Slight trace.....	1.257.....	0.0135.....	0.0036.....	0.0210.....	0.0900.....	35.144.....	23.25.....	12.00.....	118.30.....	130.20.....	Do butful.....	32
do No. 3.....	Faintly turbid, yellowish.....	Faint.....	1.683.....	2.774.....	None.....	1.375.....	0.0008.....	0.0067.....	0.0177.....	0.0596.....	23.199.....	6.50.....	90.30.....	96.90.....	96.90.....	Do butful.....	33
Cort. VII. No. 1.....	Clear, light blue.....	None.....	0.210.....	0.317.....	do	None.....	0.0054.....	0.0065.....	0.0353.....	0.0682.....	23.760.....	10.630.....	4.831.....	30.30.....	35.90.....	Unsatisfactory.....	34
do No. 2.....	Opaque, yellowish green.....	Marshy.....	0.421.....	0.690.....	do	0.1235.....	None.....	0.0045.....	None.....	0.0090.....	13.590.....	4.831.....	2.80.....	19.60.....	22.40.....	Good.....	35
Oscawaga No. 1.....	Clear, light blue.....	do	3.184.....	5.231.....	do	0.0500.....	0.0120.....	0.0200.....	0.0670.....	0.2367.....	12.560.....	3.160.....	6.00.....	27.00.....	28.70.....	Bad.....	36
Hamilton No. 1.....	Clear, light blue.....	do	0.370.....	0.775.....	do	0.0500.....	0.0120.....	0.0200.....	0.0670.....	0.2367.....	12.560.....	3.160.....	6.00.....	27.00.....	28.70.....	Bad.....	37
do No. 2.....	Clear, light blue.....	do	1.960.....	2.775.....	do	0.1594.....	0.0044.....	0.0042.....	0.0174.....	0.0770.....	24.230.....	7.730.....	2.30.....	62.00.....	62.00.....	Do butful.....	38
do No. 3.....	Clear, light blue.....	do	0.962.....	1.529.....	do	0.1594.....	0.0044.....	0.0042.....	0.0174.....	0.0770.....	24.230.....	7.730.....	2.30.....	62.00.....	62.00.....	Do butful.....	39
Groton Fall. No. 1.....	Clear, bluish.....	Smoking.....	0.962.....	1.529.....	do	0.1594.....	0.0044.....	0.0042.....	0.0174.....	0.0770.....	24.230.....	7.730.....	2.30.....	62.00.....	62.00.....	Do butful.....	40

ANALYSIS OF WATER.

Results given in Grains per U. S. gallon of 231 cubic inches.

Sample marked.	Appearance. Color.	Odor when heated to 100° Fahr.	Chlorine in chlorides.	Equivalent to sodium chloride.	Phosphoric acid in phosphates.	Nitrogen in nitrates and nitrites.	Free ammonia.	Albuminoid ammonia.	Oxygen absorbed at 60° Fahr.	Hardness equivalent to carbon-ate of lime.	After boiling.	Organic and volatile matter.	Mineral matter.	Total solids dried at 200° Fahr.	Conclusions.
Rome No. 1.....	Clear, light bluish green.....	Slight.....	0.311.....	0.843.....	None.....	0.14700.....	0.0002.....	None.....	0.0003.....	11.214.....	2.166.....	0.575.....	13.355.....	14.230.....	Good.
do No. 2.....	do do do.....	do do do.....	1.299.....	2.158.....	Slight trace.....	0.3260.....	0.0001.....	0.0002.....	0.0010.....	11.471.....	4.588.....	Trace.....	21.344.....	21.344.....	Good.
do No. 3.....	do do do.....	do do do.....	0.777.....	1.251.....	do do do.....	0.1970.....	None.....	0.0001.....	0.0010.....	10.169.....	2.294.....	Trace.....	19.114.....	19.114.....	Good.
do No. 4.....	Slightly turbid, yellowish.....	Earthy.....	0.082.....	0.135.....	Trace.....	0.01600.....	0.0001.....	0.0003.....	0.0130.....	11.159.....	3.313.....	Trace.....	2.066.....	2.066.....	Not completely satisfactory.
do No. 5.....	Yellowish green.....	Faint.....	3.150.....	6.191.....	do do do.....	0.02600.....	0.0012.....	0.0038.....	0.0570.....	22.958.....	3.441.....	Trace.....	9.736.....	9.736.....	Unsatisfactory.
Watertown No. 1.....	Turbid, brownish.....	Earthy.....	0.031.....	0.161.....	do do do.....	0.01400.....	0.0008.....	0.0047.....	0.0532.....	9.973.....	3.158.....	Trace.....	5.583.....	5.583.....	Unsatisfactory.
do No. 2.....	do do do.....	do do do.....	0.031.....	0.161.....	do do do.....	0.01400.....	0.0008.....	0.0047.....	0.0532.....	9.973.....	3.158.....	Trace.....	5.583.....	5.583.....	Unsatisfactory.
do No. 3.....	Clear, light bluish green.....	Slight.....	5.420.....	8.913.....	None.....	0.06600.....	0.0012.....	0.0020.....	None.....	0.0149.....	7.771.....	Trace.....	3.029.....	3.029.....	Unsatisfactory.
do No. 4.....	Clear, light bluish yellow.....	Off stable.....	0.205.....	0.529.....	None.....	0.06600.....	0.0012.....	0.0020.....	None.....	0.0149.....	7.771.....	Trace.....	3.029.....	3.029.....	Unsatisfactory.
West Troy No. 1.....	Turbid, brownish yellow.....	do do do.....	0.205.....	0.529.....	None.....	0.06600.....	0.0012.....	0.0020.....	None.....	0.0149.....	7.771.....	Trace.....	3.029.....	3.029.....	Unsatisfactory.
do No. 2.....	Turbid, yellow.....	do do do.....	0.184.....	0.203.....	Heavy trace.....	0.01650.....	0.0014.....	0.0035.....	0.0472.....	16.688.....	4.683.....	Trace.....	1.293.....	1.293.....	Good.
do No. 3.....	Turbid, brown.....	do do do.....	0.205.....	0.337.....	do do do.....	0.00310.....	0.0096.....	0.0147.....	0.0414.....	15.156.....	4.017.....	Trace.....	0.292.....	0.292.....	Good.
do No. 4.....	Slightly turbid, yellowish.....	Earthy.....	0.205.....	0.337.....	do do do.....	0.00310.....	0.0096.....	0.0147.....	0.0414.....	15.156.....	4.017.....	Trace.....	0.292.....	0.292.....	Good.
South pt'n No. 5.....	Clear, light blue.....	do do do.....	2.435.....	4.047.....	do do do.....	0.40900.....	0.0014.....	0.0082.....	0.0157.....	0.0791.....	9.121.....	Trace.....	9.331.....	9.331.....	Unsatisfactory.
do No. 6.....	Clear, light green.....	None.....	2.863.....	4.719.....	do do do.....	0.06730.....	0.0028.....	0.0065.....	0.0140.....	0.0801.....	3.406.....	Trace.....	2.759.....	2.759.....	Unsatisfactory.
do No. 7.....	Clear, light blue.....	do do do.....	2.352.....	3.870.....	Trace.....	0.38230.....	0.0035.....	0.0104.....	0.0137.....	0.0718.....	3.715.....	Trace.....	1.633.....	1.633.....	Unsatisfactory.
do No. 8.....	do do do.....	do do do.....	0.250.....	0.516.....	None.....	0.13530.....	0.0003.....	0.0012.....	None.....	0.0069.....	8.866.....	Trace.....	2.916.....	2.916.....	Unsatisfactory.
do No. 9.....	do do do.....	do do do.....	2.434.....	2.925.....	do do do.....	0.12400.....	0.0012.....	0.0017.....	None.....	0.0069.....	8.866.....	Trace.....	2.916.....	2.916.....	Unsatisfactory.
do No. 10.....	do do do.....	do do do.....	2.434.....	2.925.....	do do do.....	0.12400.....	0.0012.....	0.0017.....	None.....	0.0069.....	8.866.....	Trace.....	2.916.....	2.916.....	Unsatisfactory.
do No. 11.....	do do do.....	do do do.....	2.434.....	2.925.....	do do do.....	0.12400.....	0.0012.....	0.0017.....	None.....	0.0069.....	8.866.....	Trace.....	2.916.....	2.916.....	Unsatisfactory.
do No. 12.....	Turbid, yellowish green.....	do do do.....	36.....	60.063.....	Trace.....	None.....	0.16300.....	0.0018.....	0.0079.....	0.0775.....	16.166.....	Trace.....	17.757.....	17.757.....	Good.
do No. 13.....	do do do.....	do do do.....	2.57.....	4.213.....	Faint trace.....	0.71000.....	0.0120.....	0.0034.....	0.0220.....	0.0536.....	3.349.....	Trace.....	1.372.....	1.372.....	Good.
do No. 14.....	do do do.....	do do do.....	2.57.....	4.213.....	Faint trace.....	0.71000.....	0.0120.....	0.0034.....	0.0220.....	0.0536.....	3.349.....	Trace.....	1.372.....	1.372.....	Good.
Batavia No. 1.....	Clear, light green.....	Slight.....	2.64.....	4.043.....	Trace.....	0.40920.....	0.0030.....	0.0043.....	0.0220.....	0.1038.....	6.420.....	Trace.....	9.331.....	9.331.....	Good.
do No. 2.....	Cloudy, green.....	do do do.....	0.123.....	0.240.....	Trace.....	0.29300.....	0.0030.....	0.0043.....	0.0220.....	0.1038.....	6.420.....	Trace.....	9.331.....	9.331.....	Good.
do No. 3.....	Very turbid, reddish brown.....	Rotten wood.....	6.339.....	10.450.....	Trace.....	0.03230.....	0.0035.....	0.0046.....	0.0154.....	0.0935.....	30.600.....	Trace.....	2.907.....	2.907.....	Unsatisfactory.
W. Hampt. No. 1.....	Clear, light blue.....	do do do.....	6.444.....	10.520.....	Heavy trace.....	0.71300.....	0.0300.....	0.0078.....	0.2830.....	0.9254.....	9.807.....	Trace.....	6.622.....	6.622.....	Unsatisfactory.
do No. 2.....	do do do.....	do do do.....	0.157.....	0.247.....	None.....	0.09400.....	0.0025.....	0.0029.....	0.0100.....	0.0830.....	1.272.....	Trace.....	1.712.....	1.712.....	Good.
do No. 3.....	do do do.....	do do do.....	1.340.....	2.208.....	Trace.....	0.18200.....	0.0025.....	0.0047.....	0.0090.....	0.0630.....	2.857.....	Trace.....	3.907.....	3.907.....	Good.
Schach co's No. 1.....	Turbid, green.....	do do do.....	16.093.....	27.135.....	Trace.....	0.38420.....	0.0025.....	0.0047.....	0.0090.....	0.0630.....	2.857.....	Trace.....	3.907.....	3.907.....	Good.
do No. 2.....	do do do.....	do do do.....	16.093.....	27.135.....	Trace.....	0.38420.....	0.0025.....	0.0047.....	0.0090.....	0.0630.....	2.857.....	Trace.....	3.907.....	3.907.....	Good.
do No. 3.....	do do do.....	do do do.....	16.093.....	27.135.....	Trace.....	0.38420.....	0.0025.....	0.0047.....	0.0090.....	0.0630.....	2.857.....	Trace.....	3.907.....	3.907.....	Good.
Lockport No. 1.....	Slightly turbid, light blue.....	Fishy.....	4.470.....	7.773.....	Heavy trace.....	0.73300.....	0.0070.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
do No. 2.....	do do do.....	do do do.....	4.470.....	7.773.....	Heavy trace.....	0.73300.....	0.0070.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
do No. 3.....	Faintly turbid, light blue.....	None.....	5.215.....	8.967.....	None.....	0.80100.....	0.0030.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
Cortland No. 1.....	Clear, light blue.....	None.....	0.982.....	1.618.....	Trace.....	0.00300.....	0.0030.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
do No. 2.....	do do do.....	do do do.....	0.123.....	0.202.....	do do do.....	0.00300.....	0.0030.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
Cortland No. 3.....	do do do.....	do do do.....	0.123.....	0.202.....	do do do.....	0.00300.....	0.0030.....	0.0030.....	0.0130.....	0.0200.....	20.493.....	Trace.....	6.988.....	6.988.....	Unsatisfactory.
Casenovia No. 1.....	Opaque, yellowish green.....	Swampy.....	0.240.....	0.404.....	do do do.....	0.01700.....	0.0070.....	0.0117.....	0.0571.....	0.1459.....	7.890.....	Trace.....	1.633.....	1.633.....	Good.
do No. 2.....	do do do.....	do do do.....	1.858.....	3.662.....	do do do.....	0.38250.....	0.0015.....	0.0065.....	0.0119.....	0.1510.....	14.784.....	Trace.....	2.916.....	2.916.....	Good.
Hamilton No. 1.....	do do do.....	do do do.....	0.216.....	0.442.....	do do do.....	0.26600.....	0.0015.....	0.0065.....	0.0119.....	0.1510.....	14.784.....	Trace.....	2.916.....	2.916.....	Good.
do No. 2.....	do do do.....	do do do.....	0.216.....	0.442.....	do do do.....	0.26600.....	0.0015.....	0.0065.....	0.0119.....	0.1510.....	14.784.....	Trace.....	2.916.....	2.916.....	Good.
Hamilton No. 3.....	Clear, light bluish.....	None.....	0.968.....	1.998.....	do do do.....	0.19200.....	0.0025.....	0.0015.....	Trace.....	Trace.....	16.401.....	Trace.....	1.583.....	1.583.....	Unsatisfactory.
do No. 4.....	do do do.....	do do do.....	0.330.....	0.642.....	do do do.....	0.19200.....	0.0025.....	0.0015.....	Trace.....	Trace.....	16.401.....	Trace.....	1.583.....	1.583.....	Unsatisfactory.
Croton Falls No. 1.....	do yellowish.....	do do do.....	0.331.....	0.628.....	do do do.....	0.15400.....	0.0006.....	0.0017.....	None.....	None.....	1.860.....	Trace.....	1.633.....	1.633.....	Good.
do No. 2.....	do bluish.....	do do do.....	0.331.....	0.628.....	do do do.....	0.15400.....	0.0006.....	0.0017.....	None.....	None.....	1.860.....	Trace.....	1.633.....	1.633.....	Good.
do No. 3.....	do do do.....	do do do.....	0.496.....	0.840.....	do do do.....	0.24000.....	0.0002.....	0.0017.....	None.....	None.....	1.860.....	Trace.....	1.633.....	1.633.....	Good.

or private supplies during the past few months. A brief explanation of the meaning and importance of the tests and methods I have used will be found annexed to the following tabulated statement of results of these analyses:

Total Solids.

The earliest methods of gaining some information regarding a sample of water consisted in evaporating a measured quantity to dryness to determine the proportion of substances, both mineral and organic, contained in the water. The test is still used, as affording an information of a kind not to be disregarded in investigating the quality of a water. In his book on Water Analysis, Wauklyn (Water Analysis, 4th London ed., 1876, p. 3.) says: "In addition to being injurious by reason of organic impurity, water may also be injurious on account of its mineral constituents. These latter may be too excessive in amount, as in the notorious instance of sea-water, or they may be poisonous in themselves. An examination of potable water should therefore include a determination of the amount of organic solids in the water, as well as a testing for poisonous metals."

In these investigations, mineral waters having a medicinal value, are of course not considered.

Wauklyn (loc. cit. p. 14.) also states: "If the solid residue do not exceed 30 or 40 grains per gallon, the amount of solids affords no reason for rejecting the water for domestic use." (This amount would signify about 25 to 30 grains per U. S. gallon, or 43 to 57 parts per hundred thousand.)

It has been found that the figure thus obtained does not, however, represent truly the sum of the organic and mineral matters in all, or even a large proportion of cases. (Tidy Jour. Lond. Chem. Soc., xxxv, 47, Sixth Report Rivers Pollution Commission, London, 1874, p. 4, etc.) Experiments have shown that one gramme of urea with varying quantities of water, evaporated to dryness, yielded amounts varying from 0.98 gm. to 0.007 gm. (Wauklyn, Jour. Lond. Chem. Soc. xx, 445.) Similar results were obtained by Frankland. (Jour. Lond. Chem. Soc. xxi, 79.)

Besides the possible loss of an indefinite quantity of the organic substance in a water, some of the constituents may retain water (as sulphate of lime) most obstinately, at the temperature at which the water residue is dried and weighed, which would cause an error in the opposite direction. Indeed it would be difficult to specify all the possible phenomena which might occur, and on which the belief is based that the determination of total solids is only an approximation.

Organic and Volatile Matter (Loss on Ignition).

Though the mineral matter in a water has a certain importance in judging of a water, the organic matter has a far greater importance, since in it, whether as organized germs or as chemical compounds, are the principles, which, even in very small quantity, make the difference between the safety or danger in using a water. "The really injurious matters are probably organized." (Sixth Report Rivers Pollution Commission, "Blue Book" p. 4.)

The organic soluble matters are more dangerous than the insoluble. It is impossible to specify what these substances are, but they are sub-

stances in a state of change. (Assainissement de la Seine, etc., Government Report, Paris, 1876, I, p. 16.)

Organic and Volatile Matter.

It was naturally supposed that a fair idea of the proportion of organic matter in the water might be obtained by burning out the organic matter from the water residue, and weighing the remainder. As waters ordinarily contain some earthy carbonates which would be rendered caustic by the ignition, it was customary to add a few drops of carbonic acid water or ammonium carbonate, after ignition, and then to dry and weigh the residue, and calculate the loss as organic matter.

Inasmuch, however, as some of the salts contained in a water may be decomposed by this treatment, or entirely volatilized, the modified expression "Organic and Volatile Matter," or "Loss on Ignition" was adopted. Frankland's and Armstrong's experiments on this subject (Jour. Lond. Chem., Soc. xxi, 80) are very instructive. The question is well summarized by Tidy thus (Jour. Lond. Chem., Soc. xxxv, 46): The ignition process supposes,

1. That no organic matter is lost and none gained by evaporation.
2. That all the organic matter is burned off by ignition.
3. That nothing but organic matter is lost by ignition.

In all of these three points the process fails. The results are at best only coarsely approximate. (Vide. Watts Dict., v. 1023). Wauklyn (Water Analysis, 4th Lond. ed., p. 21,) states, "Chemists have been agreed for some years in rejecting the ignition process in the estimation of the organic matter in drinking water." Frankland (Water Analysis, London, 1880, p. 14.) recommends ignition as a rough qualitative test for the presence of organic matter, the degree of blackening taking place, giving some idea of the probable amounts of organic matter present. The test has been made on the samples under consideration, not because it has any great importance, but partly because it has not been entirely abandoned in this country, and partly because the difference between the "total solids" and the "loss on ignition" affords a fair approximation to the amount of mineral matters present in the sample.

Oxygen Absorbed (Permanganate test).

From what precedes, it is evident that some other process for the examination of a water is necessary, in order to decide upon its probable safety for domestic uses. Potassium permanganate is known to be one of those substances which will readily yield up its oxygen, especially in presence of a strong mineral acid as sulphuric, and the idea was long since conceived that this salt could be used to burn up (chemically speaking) the organic matter in a water, and that the measure of the amount of permanganate used could be relied upon as the means of measuring the amount of organic matter in a water.

The process proposed by Forchhammer, of Copenhagen, 1850 (Water Analysis, Frankland, London, 1880, p. 52), appears to have been the first in which this reagent was used. This mode of testing water, however, became more general after the publication of a paper on the subject, by W. A. Miller (J. Lond. Chem., Soc. xviii, 117), though many others, as Condry, Woods, Letheby, R. Angus Smith, etc., contributed to our knowledge of the best modes of making the test, and the conclusions to be drawn from the results.

As ordinarily performed, a measured quantity of the water was acidified with sulphuric acid, and then the permanganate solution added lit-

tle by little, as fast as it was decolorized, the process being continued for one, two, or three hours — always for the same length of time in every case, the solution being kept on a laboratory table loosely covered. Then the amount of permanganate destroyed, or in other words the amount of oxygen taken from the permanganate was taken as the measure of the organic substances present. Frankland (Chem. News, March, 1860), asserted that the most pernicious organic matters are those most easily oxidized by potassium permanganate, and Angus Smith (Chem. News, Sept., 1869, p. 112), pronounced the test a good one for this purpose. The first named gentleman has, however, modified his views since making that statement. (Chem. News, xxxix, 1879, p. 70.)

Performed as above described, the test did not give results strictly comparable, since the possibility of the introduction of atmospheric dust, the possibility of the conditions as to temperature (which has a marked influence), etc., made some difference with the results.

A modification of Forchammer's process has been proposed by Dr. Tidy, which gives results more satisfactory for comparison, which consists in working with measured quantities of the water, acidified with the same amount of acid, with the addition of an excess of permanganate, while a flask containing the same amount of distilled water is treated in the same way for comparison. At the end of certain periods, two minutes, one hour, three hours, four hours, the amount of permanganate remaining undestroyed is determined. (J. London Chem. Soc. xxxv, 67.)

Dr. Tidy, in his original paper, does not specify that the flasks should be kept at any particular temperature, but attention to that point appears desirable, and that element has been introduced into the process by members of the British Society of Public Analysts (Vid. Analyst for 1881), uniformity on that point appearing to be very desirable.

The results given in the tables under the head of "Oxygen Absorbed at 80° Fahrenheit," were obtained by this method substantially as described, the flasks containing the water experimented upon having been kept standing, during the periods specified, in a water bath, the temperature of which was maintained at 80° Fahrenheit.

The two minute test indicates the probable presence or absence of organic matter rapidly oxidized by the permanganate, and therefore presumably dangerous, or else the presence of nitrites, which in a drinking water is also regarded as indicating the presence of dangerous pollution.

Frankland's experiments (J. Lond. Chem. Soc., xxi, p. 83,) show that all organic substances are not equally affected by the permanganate, and he therefore does not place much reliance on the conclusions drawn from the use of this test, though a certain correspondence seems to exist between the results of this test and the results of his combustion process, when applied to waters of the same class, thus :

For London water,	oxygen absorbed by about	2.38	organic carbon
For deep wells	" " " "	5.8	" "
For shallow wells,	" " " "	2.28	" "
For u'land s'face w't'r	" " " "	1.8	" "

(Water Analysis, Frankland, London, 1880, pp. 55 and 56.)

In many cases, however, no such correspondence could be detected

(Chem. News, xxxix, p. 70), though a fair correspondence of the kind had been observed in 1418 cases out of 1686.

Wanklyn (Water Analysis, fourth ed., London 1876, p. 22), states that "the defects of the permanganate process are its want of delicacy, and also the circumstance that albumen is not readily attacked by the standard solution of permanganate."

It must be remembered that both of these gentlemen are originators of methods for the determination of probable pollution of potable waters, and each naturally enough has a strong bias in favor of his own particular process, with which he compares any process that may be or has been proposed. Other chemists not affected by such considerations, incline to the belief that the process has considerable value in determining the probable contamination of a water, though they are not disposed generally to trust it so far as Dr. Tidy is willing to.

A test somewhat similar in its bearing was made use of by the Paris commission, appointed to investigate the question of the purification of the Seine. This consisted in the determination of the volume of oxygen held in solution in a given volume of water. The rapidity with which oxygen is absorbed is considered to be the sign and even the measure of the insalubrity of a water (Assainissement de la Seine, 1876, I, p. 21). The volume of oxygen dissolved in one litre of Seine water at Paris, before receiving the contents of the sewers, was found to be 4.34 cubic centimetres, after receiving sewage amounting to about one-fifteenth of the volume of the river, it was found to be about one-fourth that amount, or 1.02 cubic centimetres, which points to the conclusion that oxygen is absorbed by the oxidation of sewage (loc. cit. p. 20).

The normal amount of oxygen in the water of the Seine is stated by Boudet (Assainissement de la Seine, II, p. 8), to be 9 to 9.5 cubic centimetres per litre. He also adds that waters most charged with organic matter are poorest in oxygen.

Nitrogen compounds in water.

Some time ago, attention was called to the fact that what is dangerous in water is the putrefactive processes which may be going on in it, and that since nitrogenous organic substances are as a rule most liable to putrefactive changes, the deleterious character of a water is no doubt proportional to the amount of nitrogen it contains. (Hofmann and Blyth, Report on Metropolitan Water Supply, London 1856.)

Several methods for the determination of the quality of a water are based upon this idea:

That of Frankland consists in the determination of the amounts of carbon and nitrogen contained in the residue obtained from evaporating a measured quantity of the water with certain precautions. Over 0.2 parts of "organic carbon" (carbon determined by this method), in one hundred thousand, when the carbon comes from vegetable matter alone, is stated to render the water bitter and unpalatable, though the presence of organic matter of animal origin does not have this effect on the taste where the proportion of organic carbon is much higher, though the water is much more unsafe for use. (Sixth Report River Pollution Comm., p. 5). The commission consider that if the organic matter is derived even only partially from animal sources, the amount of organic carbon should not exceed 0.1 part per hundred thousand for the water to be considered safe.

The proportion of carbon to nitrogen in a water is, however, looked upon as an important point in deciding on the safety of a water. From numerous analyses, Dr. Frankland (*Water Analysis*, London 1880, p. 84) deduces the following proportions of nitrogen to carbon, the amount of nitrogen being taken as unity irrespective of its actual amount.

	Ranges from	Average.
For upland surface waters,	1:4 to 1:21	1:10
“ water from cultivated land,	1:4 “ 1:10	1:6
“ shallow wells,	1:1 “ 1:9	1:4
“ springs and deep wells,	1:2 “ 1:6	1:4
“ urine and sewage,	1:1 “ 1:3	1:2

Information of value as to the quality of a water is no doubt given by this method of testing, but the process has been severely criticised by advocates of other processes for water analysis, as to the analytical methods used to obtain the results, and hence as to the results themselves. (*Wanklyn Water Analysis*, 4th London ed., 1876, p. 22; Tidy, *Jour. London Chem. Soc.* xxxv, 51.) Chemists generally find that the process requires delicate and costly apparatus, and involves troublesome manipulation, with the risk of making unavoidable errors, larger than the entire amounts experimented upon, though the idea of determining the amounts of carbon and nitrogen in the organic matter of a water, and their ratio to one another, if it could be done with fair accuracy is thought to be most excellent.

Ammonia.

It is generally accepted as a fact that the nitrogenous organic matter in water by the process of putrefactive decomposition first affords considerable quantities of ammonia, then of nitrites and finally nitrates. By this it is not meant that these changes succeed one another sharply, but that when water has taken up some organic matters containing nitrogen in the first stages of the decomposition of that organic matter, ammonia is usually most prominent, and later on especially if the water percolates through the soil, nitrites and nitrates assume prominence.

Tronnisdorf (*Fres. Zeitschrift for Analyt. Chem.* ix, 165), states that ammonia is the product of the putrefaction of nitrogenous organic matter, and nitrates the last product of their decomposition. Boudet (*Assainissement de la Seine*, 1876, II, p. 5), makes essentially the same statement with regard to the ammonia, and adds “there is reason to believe that there exists a relation of proportions between the quantity of these substances (organic matters), their degree of decomposition, the ill-health which they produce, and the ammonia of which they are the source, and which they leave in solution in waters.”

The Rivers Pollution Commission (*loc. cit.*, p. 12), state that ammonia in waters is derived almost exclusively from the decomposition of animal matter. References of the same purport might be given from numerous other high authorities.

Investigations, the results of which are embodied in the report of the Paris Commission (*Assainissement de la Seine*, I, p. 16), showed that on adding sewage to the Seine the ammonia was increased from 0.06 to 1. or 1.5 milligrammes per litre (0.006 to 0.1 or 0.15 parts per 100,000).

Rain water, however, especially when its falling is accompanied by electrical phenomena, may contain some ammonia. An average of 71

samples of rain water collected in England, contained 0.05 parts ammonia per hundred thousand, including a maximum of 0.21 part, which was exceptional. (Rivers Pollution Commission, 6th Report, 1874, pp. 27 to 29.) Frankland (Water Analysis, London, 1880, p. 18), gives the following averages for ammonia in 100,000 parts of water :

Rain water in the country,	0.03 parts.	
Upland surface-water,	0.002	maximum, 0.008.
River waters,	0.01.	
Spring waters,	none, or very minute amounts.	
Sewage,	5.	varying from 2 to 10 parts.

Fischer (Chemische Technologie des Wassers, Brunswick, 1875, p. 105) gives two analyses of typically good wells, containing respectively 0.048 and 0.044 parts of ammonia per 100,000, and of two typically bad shallow wells, containing respectively 0.084 and 2.227 parts ammonia in the same amount.

The proportion of ammonia, however, though giving valuable information as to the quality of a water, is subject to variations. Houzeau (Comptes Rendus, LXXXIII, 525), showed that water containing ammonia gradually lost that constituent by standing. The probability of the change being caused by an organized ferment was suggested. Other experiments by M. Houzeau, and by others, have proved this hypothesis. (Schloesing and Munz, Comptes Rendus, LXXXIV, 301, Bous-singault; Warington, Jour. Lond. Chem. Soc., 1878, 1, 74; Storer, Am. Jour. Sci. and Arts, xv, June, 1878), etc., etc.

In the Paris Report Assainissement de la Seine, pp. 152, 159, 187, etc., it is stated that the humus of the soil is an active agent in oxidizing the ammonia and nitrogenous organic matters to nitrates and nitrites.

Notwithstanding such possibility of changes in the amount, the determination of the proportion of ammonia in a water is evidently of too much importance to be neglected.

Free and Albuminoid Ammonia.

In view of the facts already mentioned, and also in consideration of the fact that albumen and similarly constituted nitrogenous substances could be made to give up a definite proportion of their nitrogen in the form of ammonia when boiled with an alkaline solution of potassium permanganate, Wanklyn and some others proposed a method for the determination of the probable safety of a water by boiling it first with some alkaline solution, as sodium carbonate, and then with an alkaline solution of potassium permanganate. The ammonia formed or given off by the first part of the treatment described, is designated as "free," that by the latter part of the treatment as "albuminoid." (Jour. Lond. Chem. Soc., 1867, xx, 445, Wanklyn, Chapman and Smith.) The ammonia being carried over with the stream, is caught in the distillate and there determined. Since impure urea, when boiled with alkaline solution, yields ammonia, some have called the ammonia thus obtained "ureal" ammonia, instead of "free." In fact, as can readily be seen, the amount of ammonia obtained by boiling with sodium carbonate represents the ammonia actually present as such, plus the amount derived from the decomposition of urea or kindred bodies present. Still,

independent of the question of the name, urea, or bodies of similar constitution, should not exist in a water to be used for drinking purposes, and the amounts of ammonia to be obtained in this way adds not a little to our knowledge of the probable quality of a water.

The following results from Wanklyn's book on the subject, *Water Analysis*, 4th ed., Lond., 1876, indicate that some correspondence exists between the amounts of free and albuminoid ammonia and the degree of contamination.

Deep spring water,	Not over 0.001	part per 100,000
“ “ “mixed with surface water,	0.005	“ “ “
Filtered water,	0.005 to 0.010	“ “ “
Water imperfectly filtered,	0.01 “ 0.02	“ “ “
Sewage (Harrowgate), free 5.50	0.3	“ “ “
Urine, free 900.	50.	“ “ “

Water imperfectly filtered — the fourth on this list has been observed to produce diarrhoea in communities using such water (*loc. cit.*, p. 39). Other samples of sewage yielded different results, but the main fact that the proportions of free and albuminoid ammonia are high in sewage, and in numerous waters known to be dangerous, is shown by Wauklyn's experiments.

When the free ammonia is over 0.008 (per 100,000), it is believed by Mr. Wauklyn to be almost invariably derived from the fermentation of urea, and of course the water is to be regarded with suspicion, but the most important point in the estimation of Wanklyn is the proportion of albuminoid ammonia.

This process on account of its ease of execution, and usually (presumably), reliable indications has been much used by chemists both in England and here. It has been severely criticized as usual with any process which might be proposed to take such an important part in a matter of such vital consequence (*Vid. Frankland, Jour. London Chem. Soc.*, xxi, 79, xxix, 84; Tidy, *Jour. London Chem. Soc.*, xxxv, 61, 96). Others not prejudiced in favor of any particular method of water analysis have found, or believe they have found, cases in which bad waters would not be condemned by this process. Ekin (*Potable Water*, London 1880, p. 9), says: "Waters which have undoubtedly given rise to typhoid fever, have been found by the writer over and over again not to contain more than 0.05 parts of albuminoid ammonia in one million (0.005 in 100,000 — regarded by Wanklyn as safe), and notwithstanding their containing a large excess of nitrates, have been passed by analysts of undoubted ability as being fit for drinking purposes." A case in point is cited. A similar case, where the water was afterward proved to be contaminated with sewage, came to the personal knowledge of the writer of this report.

Some chemists, however, have as implicit faith in this process to the exclusion of every other, as the inventor of it himself, but many others consider it as only to be relied upon to a limited extent, *i. e.*, that the probabilities are against a water which is condemned by this process, but that if it appear to be good by this process it may not really be safe in all cases.

Nitrogen as Nitrates and Nitrites.

As already mentioned there is good reason to believe that the oxidation compounds of nitrogen, nitrates and nitrites, when in water, are derived from the oxidation of nitrogenous organic material chiefly of animal origin. The investigations of Palmer on the nitre deposits of India (Jour. London Chem. Soc., xxi, 318), showed that nitrates (in sufficient quantity to make the collection of the soil and subsequent leaching of it profitable), only occurred around habitations, and places where large amounts of animal matters were deposited. The Rivers Pollution Commission state (6th Report, p. 12), that the presence of nitrates and nitrites indicate previous animal contamination, since vegetable matters furnish none or mere traces, these compounds being formed more rapidly by percolation through the soil than by flow in a stream. This point is sustained by numerous authorities. Frankland gives the following amounts as occurring in waters. (Water Anal. London, 1880, p. 28.)

	Variation.	Average.
Rain water (71 samples),	0 to 0.044	0.007 parts per 100,000
Upland surface water,	0 to 0.05	0.009 " " "
Deep wells and springs,	0 to 3.	0.40 " " "
Surface waters (cultivated d'trict)	0 to 1.*	0.25 " " "
Shallow wells, no average,	2. to 5.	parts common.

Prof. Wagner (Jour. für Gasbeleuchtung, No. 8, 1873), estimate that the amount of nitrates used from the Munich wells in one year calculated as saltpetre, would give 670,000 killogrammes (about twice that number of pounds) of saltpetre, which would suffice to make over 18,000 cwt. of gunpowder.

Of course in themselves these compounds to the extent to which they exist in water are harmless, but are simply the indication of contamination at some time, and there is a great difference of opinion as to the value of the conclusions to be drawn from their presence. Frankland (loc. cit.), believing that a water which has once been contaminated, is always open to suspicion, takes the ground that their presence is of great importance in pronouncing upon the safety of the water, while Wanklyn (Water Analysis, p. 83), considers them of but little importance in measuring the defilement of a water, and argues that since some strata (as the chalk formation), yield large amounts of nitrates to water, and on the other hand processes of vegetation in rivers and lakes are calculated to withdraw nitrogen in those forms from the water, hence the proportion of nitrates "affords no data of any value in judging of the organic quality of a water. All shades of opinion on this point exist between these two extremes, but the general impression is in favor of Frankland's view, since by accepting that the error, if any, is on the side of safety.

Though large amounts of nitrates usually indicate percolation through the soil, which probably may eventually purify the water completely, there is room for questioning whether the oxidation of the dangerous ingredients has been complete. A case is referred to in the Rivers Pollution Commission Report (6th Rept. Appendix No. 4, p. 463), taken from Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege,

* Of rare occurrence.

vol. vi, p. 154, where typhoid fever poison was not removed from a subterranean stream after passing underground for nearly a mile. This may have been an extraordinary case, but such a condition of affairs might occur elsewhere, and it may be difficult to decide where.

Some chemists regard the presence of nitrites (a lower degree of oxidation than the nitrates) as an indication that the oxidation of the dangerous compounds has probably been incomplete, and accordingly condemn water in which these are found. (Heraeus *Archiv der Pharma.*, Apr., 1873; Tidy, loc. cit. p. 75) but nitrites are of rare occurrence in water, and many waters might be polluted and yet give no indication of the presence of nitrites to any test we might apply.

Chlorine.

In noting so far as possible the distinguishing characteristics of sewage, from the presence of which in water so much danger is to be feared, the large proportion of chlorine in combination as chloride is very noticeable. On this account the presence of chlorides in a drinking water has been accounted as of some importance in the examination of a water. Food contains considerable amounts of chlorides, and we add to it still more by way of condiment in the shape of salt. The well-known fact that animals as well as men require salt more or less frequently with their food, needs but a passing allusion. The chlorine, whatever changes it may pass through, is thrown off from the system in the excreta and thus appears in the sewage.

Frankland gives the following average number of parts per hundred thousand in waters from various sources:—

(Water Analysis p. 19)

Rain water,	0.22
Upland surface water,	1.13
Deep wells,	5.11
Springs,	2.49

The Rivers Pollution Commission give per 100,000 parts, 6th report, pp. 19, 20:

Sewage maximum, 21.5. Minimum, 6.5. Average, 11.54.

The effluent waters from various manufacturing industries showed amounts varying from 19.750 parts (from a bleachery) to 0.6 part as a minimum.

Over 5 parts per 100,000 is considered by the commission as in most cases due to pollution.

Various considerations, however, such as the nature of the strata through which the water passes, proximity to the sea, etc., affect the proportion of chlorine which may be present in a water, and the test is chiefly of value where the normal amount which the water should contain is known, and if it exceeds that, a further investigation is desirable. (Fischer, *Chemische Technologie des Wassers*, Brunswick 1880, p. 105; Wanklyn, *Water Analysis*, 1876, pp. 15 and 16.)

Vegetable contamination, however, should be avoided, and against this the determination of the chlorine is no guarantee. (Wanklyn, loc. cit., also p. 41) The difference in the amounts of chlorine present in a water free from sewage, and the same water containing a small, but perhaps dangerous amount, are sometimes too small to attract notice.

The test, therefore, though of some value, has not all the importance which has often been ascribed to it.

In the tables of results the proportion of chlorine has been given, and in the next column the sodium chloride, corresponding to it, as giving a better idea of the amounts present.

Hardness.

Lime salts are the chief cause of hardness in water; compounds of magnesia, iron, and other elements, however, also may contribute to the soap-destroying power of the water, which is practically meant by the term. Chemists recognize two kinds of hardness: 1. Temporary, which is caused by the presence in the water of those elements held in solution in consequence of the presence of carbonic acid. By boiling the water, the carbonic acid holding them in solution is driven out, and the compounds in solution, in consequence of its presence, separate in the solid form, and can be removed by filtration. 2. "Permanent" hardness, which is caused by the above bases, which are in combinations not converted into the insoluble form by boiling sulphates, chlorides, etc., chiefly the first named. The temporary and permanent hardness together constitute the "total hardness."

To express the hardness in some tangible form, the usual custom in this country and in England is to give results in the corresponding amounts of carbonate of lime, *i. e.*, practically to determine the amount of soap destroyed by a measured quantity of the water, and then to state the results as the amount of carbonate of lime which would destroy that quantity of soap.

The Rivers Pollution Commission gives the following figures for the hardness of waters in parts per hundred thousand:—

	Temporary.	Permanent.	Total.
Rain water, average,	0.3	1.7	0.62
Highest from different geological formations,	38.6	48.5	75.
From 272 samples of water from shallow and polluted wells:			
Minimum	0.	3.8	9.9
Maximum,	52.	164.3	191.
Average,	19.	31.5	50.5

On account of the presence of considerable amounts of lime compounds in our food, sewage is usually quite hard, especially exhibiting a high figure for permanent hardness. Like the chlorine, the test has some bearing on the question as to whether the water is probably polluted with sewage or not, but is of far inferior importance, since, as the above figures show, the proportions of constituents making the water hard may run very high in a water uncontaminated by sewage.

The hardness has, however, much significance, upon the economic side. Hard water is objectionable for domestic purposes, in washing, and for manufacturing purposes in boilers. With regard to its effect upon health, the English Commission took a great deal of testimony. (6th Report, pp. 184 to 194). One witness said that soft water was more conducive to health, as people were more apt to be cleanly when they had soft water to use; another that lime-sulphate in the water appeared to disagree with some persons; another that the death-rate was appa-

rently a little lower in towns supplied with moderately hard water. About 10 to 14 degrees of hardness per gallon (14 to 20 per hundred thousand), was deemed by some to be beneficial. The question of the connection of the hardness of the water with the death-rate was investigated, and from numerous statistics taken in the United Kingdom, it was found that there seemed to be no necessary connection. The conclusion of the commission was, that though there were some differences of opinion "there is almost absolute unanimity as regards the wholesomeness of soft water." Popular prejudice runs in the same direction, especially when comfort in washing, and economy of soap and boilers are taken into consideration, while for sanitary purposes no objection can be urged to the use of soft water, other things being equal.

In our tables of results the hardness is stated as mentioned in the equivalent of carbonate of lime. The hardness "before boiling" is in effect "total hardness," that "after boiling" the "permanent hardness," which latter is the most objectionable form. It might be taken as an approximate statement of the relative amounts of sulphates present in the waters. The difference between the two forms of hardness would give the temporary hardness, the measure of the amounts of carbonates present.

Phosphoric Acid in Phosphates.

Sewage undoubtedly contains a considerable amount of phosphates; the presence of lime, however (if, as is usually the case, the water contains alkaline or earthy carbonates), tends to precipitate the phosphoric acid out of the water, and, except in very small amounts, phosphates cannot exist in a clear water. Their presence, however, in a water would indicate a possibility of sewage contamination, though in some cases they might be derived from geological formations. The test was therefore made qualitatively, to obtain, if possible, more light on the probable safety of the water examined.

Odor.

For comfort, if for nothing else, potable water should be free from odor. The odor often may give rise to suspicions which a subsequent examination may confirm. At times, however, waters have unpleasant odors and taste which do not seem to have any effect on their safety for domestic uses. These seem to be connected with the appearance or death in the water of some of the microscopic organisms invariably present in water. The odor, therefore, alone, may be misleading, but may serve as an adjunct to a more extended examination.

In making the test recorded, about three or four ounces of the water was placed in a small flask fitted with a cork, through which was passed a thermometer. After introducing the water and inserting the cork, the flask was warmed until the thermometer indicated 100° F. The flask was then shaken, the cork withdrawn, and the odor immediately observed. In this way satisfactory and uniform tests were obtained.

Appearance, Color.

The appearance, like the odor, of a water, may at times be objectionable, a turbidity, however, after standing some time, indicates mat-

ter in a minute state of sub-division, which is, to say the least, undesirable, even though it may be innocuous.

As to color, the natural color of a pure water is light-bluish, but impurities may modify that tint very much. Tidy recommends (*Jour. Lond. Chem. Soc.*, xxxv, 84), making an observation on the color of waters examined in conjunction with other tests. He believes that to a practiced eye

"1. The peculiar *tint* is an indication of the *kind* of organic matter present.

2. The tint-depth is the indication of the *quantity* of organic matter in a water."

Fresh peat imparts a peculiar greenish-brown tint, older peat an olive-brown tint. A yellow tint is often a suspicious sign, while a faint bluish-tint is that of water probably very pure.

Dr. Frankland characterizes this view of the subject as purely sentimental. (*Chem. News*, xxxix, p. 69). Dr. Angus Smith (*Chem. News*, June, 1869), asserts that a colorless water may be bad, and a colored water may be good.

The results recorded on these points were obtained by the use of what is known as the "two-foot tube," a colored glass tube two feet long and about two inches in diameter, closed at either end with a glass plate cemented on, and filled with the water to be examined. By sighting through the tube toward a piece of white paper held at the opposite end, the appearance noted was observed.

Standards.

Some analysts have fixed certain standards of purity for water, or limits for the results of certain of the above mentioned tests, according to which, if certain figures are exceeded, the water is to be condemned as unsafe. These proportions, though stated in different ways, grains per gallon, milligrammes per litre, etc., are here all given in parts per hundred thousand, for uniformity.

Frankland (*Water Analysis*, London, 1880, p. 86) gives the following for the amounts of nitrogen and carbon together:

Class.	Upland surface waters.	Other waters.
I, great purity.	0. to 0.2 parts.	0. to 0.1 parts.
II, medium.	0.2 to 0.4 "	0.1 to 0.2 "
III, doubtful.	0.4 to 0.6 "	0.2 to 0.4 "
IV, impure.	over 0.6 "	over 0.4 "

For spring and deep well-water the proportion of nitrogen to carbon is of but little importance, though the amount of carbon should not much exceed 0.1 part of carbon.

In surface water, if the proportion of nitrogen to carbon is 1 to 3, the organic matter is of animal origin, if 1 to 8 it is chiefly of vegetable origin (p. 83).

If the chlorine exceeds 5 parts, sewage is to be suspected, if under 1 part, the water is probably free from sewage (p. 20).

The Rivers Pollution Commission, of which Dr. Frankland was the chemist, establish a standard based on the probable previous sewage contamination of a water. After deducting for the nitrogen, which might come from the rain, etc., 0.032 part of nitrogen, and assuming that sew-

age contains 10 parts of nitrogen per 100,000, this formula is used. Previous pollution = 10,000 ($N=0.032$), in which N represents the amount of nitrogen found by analysis in 100,000 parts of the water. The standards then given are:—

Reasonably safe.	Previous contamination	not over 10,000 parts.
Suspicious	" "	" " 20,000 "
Dangerous	" "	— over 20,000 "

(6th Report, p. 17.)

Dr. Tidy classifies waters according to the amounts of oxygen which they absorb from potassium-permanganate in an acidified solution, as before mentioned, after standing for three hours (Jour. London Chem. Soc. xxxv, p. 91). His standards are:—

Class 1. Great organic purity,	absorb	0	to 0.05	part oxygen.
" 2. Medium purity,	"	0.05	" 0.15	" "
" 3. Doubtful,	"	0.15	" 0.21	" "
" 4. Impure,	"	— over 0.21	" "	" "

The absorption of considerable amounts of oxygen in two minutes indicates the probable presence of nitrites, which should not be present in a water.

Prof. Wanklyn bases his judgment of a water on the indications of the amounts of free and albuminoid ammonia (Water Analysis, 4th London ed., 1876, pp. 53 and 54). His classification referred as above to parts per hundred thousand:—

Class 1 Extraordinary purity,	0	to 0.005	part albuminoid ammonia
" 2. Satisfactory purity,	0.005	" 0.010	" " "
" 3. Dirty,	— over 0.010	" " "	" "

If the albuminoid ammonia exceeds 0.005 parts, the free ammonia must be taken into account. Much free ammonia is a suspicious sign of probable recent sewage. If free ammonia is absent or small in amount, a water should not be condemned unless the albuminoid ammonia is something like 0.010 part albuminoid ammonia; while over 0.015 part ought to condemn a water absolutely.

The absence of chlorine, or a small proportion with large amounts albuminoid ammonia, would indicate probable vegetable contamination. A large proportion of chlorine, 7 to 14 parts, may be under some circumstances suspicious. Over 57 parts of total solids must be regarded as objectionable.

Mr. Ekin, F. C. S., who has had much experience in the examination of suspected sources of water supply, in a critique on the various methods of water analysis, and the conclusions to be drawn from them, accepts, with some qualification, some of the standards given, but insists as the result of experience that the proportion of nitrogen as nitrates should be taken into account, as of primary importance. (Potable Water, London, 1880, p. 20.) If the amount exceeds 0.5 or 0.6 parts, he believes the water is dangerously polluted.

Other authorities support this view, fixing the limit, however, at other points (Fischer Chemische Technologie des Wassers, p. 140), thus:—

The Vienna Commission,	at the equivalent of 0.104 parts per 100,000
The Hanover	" " " " " 0.26 " " "
Brandes at the equivalent of	0.7 " " "

Fischer (Jour. für Prakt. Chem. [2] VIII, 123), considers that at most a good water should contain per 100,000 ;—

1. Organic matter, 4. parts equivalent to 0.2 part absorbed oxygen.
2. Chlorine, 3.55 to 4. parts.
3. Nitric acid ($\text{N}_2 \text{O}_5$), 2.7 parts equivalent to 0.7 part nitrogen.
4. Sulphuric acid (SO_3), 8 parts.
5. Magnesia (MgO), 2.4 "
6. Lime (CaO), 8.0 "
7. Hardness equivalent to Lime 16.8° German standard. \ Equivalent to about 29. parts carbonate of lime.

Ammonia and nitrites should not be detected by test made on the water without concentration.

The English authorities practically agree in saying that so much as is possible to be learned regarding the history of a water, is to be taken into account in giving an opinion upon it.

The English Society of Public Analysts, while not accepting the rigid interpretation put upon the various determinations recommended by inventors of different processes, consider that they all have some value in forming a judgment regarding a water, and a system of valuation has been proposed in that society, which takes all the determinations made as recorded in the accompanying tables (except organic and volatile matter) into account, by which a water is to be judged. Of course different degrees of importance represented by numbers, are attributed to the different determinations, and from the sum of all these numbers a decision is pronounced. (Analyst, 1881, vol. VI, 111.) The plan, though perhaps capable of improvement in some of its details, is regarded as good.

The decisions on the waters under consideration in accordance with the above standards, though agreeing in the main, are sometimes widely at variance. In one of the tables, the decisions according to these different standards are given in illustration of this point.

Conclusion.

In reviewing the methods of water analysis for sanitary purposes, and the conclusions to be drawn from the results, we cannot but conclude that our knowledge of the whole matter falls very far short of what is desirable.

The nature of the body or bodies which renders a water dangerous to health, is as yet unknown. That they contain organic elements, carbon, nitrogen, hydrogen and oxygen, is very probable, since the waters which harm human beings by their use, unless contaminated by mineral poisons, are those containing perceptible amounts of those elements. That they are organized bodies, germs if we will, is also probable, yet both of these hypotheses are after all only hypotheses, though based on a large array of facts.

We may, perhaps, hope at some future day to discover by chemical means the constitution of certain organic compounds produced by, or forming an integral part of these bodies, and be able to separate and determine them, or, by the aid of the microscope, to find and identify the germs which are objectionable. This, however, is speculation as to the future. At the present time, the utmost that we can do is to

endeavor to discover whether a given water affords favorable conditions for the growth of dangerous germs, assuming that hypothesis to be correct. The processes of putrefaction, especially those of animal matters, are most likely to afford organisms dangerous to the human system; therefore, though some dangers are to be apprehended from decaying vegetable matter, the dangers from the presence of sewage in a water are much greater. If, then, we could detect even the minutest traces of sewage in a water, it would serve as a basis for pronouncing a decision upon it. But here again we are at fault, since, so far as known, there is no element or principle existing in sewage and characteristic of it which would survive the percolation through a few feet of soil, that does not exist in waters of undoubted purity. Organisms which can be recognized and classified, carbon and nitrogen, ammonia, nitrates, chlorine, lime salts (represented by hardness), etc., all are found in waters the safety of which for use is beyond question. We are driven to determining, as near as possible, the amounts of some of those substances which may exist in pure waters, and then regarding any results in a suspected water which show larger amounts of those substances than the water properly should contain as suspicious signs. That is what all of the various tests proposed by numerous chemists can claim to do.

But again, how much of these different constituents should the water properly contain? A review of the different amounts of carbon, nitrogen, ammonia, etc., that pure waters may contain, as given by the best authorities, shows such wide differences in pure water, from different sources, that the attempt to draw a line anywhere seems hopeless. But one circumstance comes to our aid, but that does not go very far. The water from mountain springs contains these compounds, varying between certain limits, that from undefiled rivers between certain other limits, and so on for water from other pure sources of supply. Then, by drawing a line for each constituent at the maximum amount of these constituents found to exist in waters known to be pure, and condemning all waters which come from sources under similar conditions which contain more than those amounts, we can fix *some* limit, though those are far from satisfactory.

By this means we may condemn many good waters as bad, and what is worse, pass many bad waters as good. Suppose, for instance, that pure water in a mountain region contain 0. to 0.5 part of nitrogen as nitrates, and 1 to 2 parts of chlorine per hundred thousand.

Now suppose in such a certain water, which normally contains 0.02 parts of nitrogen as nitrates and 1. part of chlorine, to receive a small addition of sewage sufficient to bring the figures respectively up to 0.04 and 1.5. Now, unless the water had been analyzed immediately before the addition of the sewage, and again after, there would be no good reason for condemning it, and yet it may have been completely poisoned. Even if it had been analyzed some little time before, we would be uncertain about condemning it, as it is well known that the water from the same spring may be different in composition at different times, owing to rains, and also to other causes, the reason for which is not so apparent.

The chlorine and nitrogen, as nitrates, have been taken simply to illustrate the point; any other constituent or determination made on waters by analysis would serve in the same way.

Evidently the means of determining, even approximately, the safety of a water are at present extremely crude and unsatisfactory.

It has been assumed in the above discussion that the methods of analysis employed were absolutely correct and gave absolutely correct results. When, however, we consider that the errors to which all human beings are liable, attaches to chemical manipulations as well as to any thing else, and that the "margin of error" is always an element in chemical work, and also that our process for obtaining results may contain unsuspected sources of error, the unsatisfactory nature of deductions drawn from an examination are increased.

Our present methods are the best we can do, but fall very far short of what is to be desired, and what it is to be hoped we may some day attain.

Respectfully submitted,

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REPORT ON THE METHODS AND APPARATUS FOR TESTING INFLAMMABLE OILS.*

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I. INTRODUCTION.

Any argument in favor of the State taking upon itself the duty of regulating the quality of kerosene oil appears very superfluous to those acquainted with the nature of the oil now sold, and the damages to life and property due to the unregulated sale of this illuminating material throughout the State.

In New York city it is the province of the "Bureau of Combustibles" to test the oils sold. In the year 1880 the fire commissioners' report shows that there were 103 fires from kerosene oil lamps in a total of 1783 fires from all causes; fifty-four of these fires from kerosene are designated explosions, and from these "explosions" there was a loss by fire of \$14,165. These fires occurred in spite of the vigilance of the Bureau of Combustibles in testing the kerosene oil sold in New York city. Of over nine thousand samples collected forty-three were found below the standard test of 100° Fahrenheit in Tagliabue's closed apparatus.

But the loss in a city like New York, with its finely-equipped and ever-ready fire department, is no measure of the damage done in other cities and towns throughout the State, where the oil is never tested, and where the largest amount is consumed, since gas-light is not obtainable or costs much more than in New York city. The fires caused by kerosene oil lamps are rated third in point of number, and the reason there is comparatively so little damage done in a city like New York is more to the credit of the fire department than to the quality of the oil sold to poor and often ignorant people who are compelled to use it as the cheapest source of illumination.

The danger from kerosene oil lies in the fact (often pointed out before) that it is a product of crude petroleum, which consists of a variety of inflammable liquids which the oil refiner should separate from one another in the most careful manner.

*These investigations have been made in accordance with instructions of the State Board of Health to its Sanitary Committee, in terms as follows:

"Resolved, That the Sanitary Committee be authorized to spend a sum, not exceeding one hundred and fifty dollars, in prosecuting the investigations preparatory to testing petroleum, in establishing a standard for such test in this State." E. H. Secretary of the Board.

These various liquids contained in crude petroleum are more or less volatile, and it so happens that the most volatile give the most brilliant light when burnt. It is also a fact that the vapors of the more volatile portions of crude petroleum mix very readily with air and produce mixtures that explode violently when ignited. The crude petroleum cannot be burned in a lamp without refining because of these easily ignitable vapors and also because of its odor. It then becomes the duty of the oil refiner to distill the crude oil in order to separate the more volatile liquids from those less volatile and select those best suited to burn in an ordinary kerosene lamp. From what has been said above it is obviously to the interest of the oil refiner to leave in the oil called kerosene as much of the more volatile materials as is consistent with his idea of safety, since these add materially to the brilliancy of the light. It must be further noted that it is the kerosene oil that is the most valuable to the oil refiner, since it brings a better price than the more volatile liquids, and the more of these latter he leaves in his kerosene the greater his profits. It has been left to the oil refiner to decide as to the amount of these more volatile liquids he shall leave in his products, in face of the fact that it is to his interest to leave in as much of them as possible. From a consideration of this circumstance alone, it is obvious that much oil sold in New York and elsewhere is only just able to pass when tested under circumstances similar to those that obtain in burning in an ordinary kerosene lamp. And it cannot be doubted that in places under no supervision by inspectors, there is much oil that is dangerous to life and property.

Of the 103 fires in New York city last year (1880) from kerosene oil lamps I have noted that fifty-four were caused by "explosions"; the other forty-nine were caused by the breaking of kerosene oil lamps. If the oil in these lamps had been of the proper quality these fires would not have happened, for it is only low-test oils that take fire at a low temperature. Kerosene oil with a high flashing point will have a high burning point; i. e.: Oil that will not give off inflammable vapors at a comparatively high temperature will not take fire itself until it is raised to a still higher temperature. For example, an oil that can be raised to 140 degrees Fahrenheit before it will give off an inflammable vapor can be burnt in a lamp; that lamp broken, and only the ignited wick will still burn. But under the same circumstances an oil which gives off inflammable vapors at 100 degrees Fahrenheit will not only burn at the ignited wick, but flames will run over the whole surface of the oil and envelop every thing that it comes in contact with. If we now remember that in summer our houses often have a temperature of ninety degrees Fahrenheit, and that the best oils sold in New York

city will give off inflammable vapors at but a few degrees above 100, we need not be surprised at kerosene oil explosions, and fires caused by using inferior grades of oil with low flashing points.

The loss of property from these causes is bad enough, but the loss of life, and more often, what is much worse, permanent injury resulting from burning with the low-grade oils, makes this matter pre-eminently a proper one for State regulation. It is not the better informed and intelligent citizen that runs these risks to life and property, because he uses gas or a safe kerosene oil. It is the poor and hard-working people, not so well informed, and whose few dollars have to be made to go the farthest in purchasing the necessities of life that suffer most. These people buy inferior oils because they cost a trifle less than safe ones; the management of the lamps usually falls to the lot of the women and children, of the household who least appreciate the danger of handling these low-grade oils. These oils often emit enough vapor in a warm room to burn around the base of the burner in small bluish jets, and a woman or child, under such circumstances, gets frightened, lets the lamp fall, becomes enveloped in flames, and if fortunate, may escape with life and scars to be carried to the grave. This is no fancy picture, even the newspapers contain accounts of these horrors every few days, and they are generally due to the use of low-grade kerosene oils. Any fear in handling a kerosene lamp or danger from breaking one is entirely removed by having the flashing point of the oil so high that no inflammable vapors shall be given off from it at temperatures that may obtain in the burning of an ordinary kerosene lamp. And the number of these accidents from kerosene oil shows that the oil refiners will not raise the standard of quality in refining these oils unless some pressure is brought to bear upon them by the State.

To determine at what temperature a sample of kerosene oil will emit an inflammable vapor, quite a number of pieces of apparatus have been devised. The points that need attention in these apparatus are, gradual heating of the oil, an accurate register of the temperature, and a sharp and uniform means of igniting the vapor when it forms.

Of the various apparatus used for this purpose I have examined the following :

- I. Tagliabue's Open Tester.
- II. Arnaboldi's Open Tester.
- III. Saybolt's Open Tester (Electric).
- IV. Tagliabue's Small-closed Tester.
- V. Tagliabue's Large-closed Tester.
- VI. Wisconsin State Tester (Loosely closed).
- VII. English Government Tester (Abel's closed).

- VIII. Bernstein's Tester (closed).
- IX. Millsaugh's Tester (closed).
- X. Mann's Lamp Apparatus.
- XI. Foster's Automatic Tester.
- XII. Salleron-Urbain Apparatus
- XIII. Pease Electric Tester.

The following table shows the results obtained with these apparatus when used on four different samples of oil. The oils marked Nos. 1 and 3 were the best sold in New York city; the oil marked No. 2 was bought at a small store on Second avenue, New York, and had a pale amber color; No. 4 oil was a mixture of No. 2 oil and petroleum naphtha of seventy-one degrees Beaumé, to reduce the flashing point. Each apparatus was tested at least twice and often many more times to insure a fair trial, and the results given in the table are averages of experiments made under conditions suited to the best working of each apparatus. The figures in the columns under the names of the different apparatus give the degrees on the Fahrenheit thermometer at which the oil gave off an inflammable vapor (its flashing point).

OIL USED.	I. Tagliabue's Open.	II. Arnaboldi's Open.	III. Saybolt's.	IV. Tagliabue's Small Closed.	V. Tagliabue's Large Closed.	VI. Wisconsin State.	VII. English Government.	VIII. Bernstein's.	IX. Millsaugh's.	X. Mann's.	XI. Foster's Automatic.	XII. Salleron-Urbain.	XIII. Pease's
No. 1	110	118	120	111	117	107	103	130	111	95	119	These instruments do not record the flashing point.	
No. 2	111	121	124	115	118	109	102	128	107	96	.....	
No. 3	119	122	122	112	118	108	102	130	108	95	118		
No. 4	97	96	97	90	93	86	76	90	81	75	96		

From an inspection of this table it will be seen that it is very important to know which apparatus has been used when an oil is said to have a given flashing point. In the case of No. 1 oil the range of temperature is from 95° to 130° Fahrenheit; with No. 2, the range is from 96° to 128°; with No. 3, from 95° to 130°; while No. 4 ranges from 75° to 97°.

The merits of each apparatus have been discussed in the details of experiments described later, and the general considerations from these experiments will be given here.

**APPARATUS IN WHICH THE OIL SURFACE IS FREELY EXPOSED — THE
“ OPEN TESTERS.”**

In the testers marked I, II, III, kerosene oil always has a higher flashing point than in closed or partially closed apparatus. This is easily accounted for from the fact that in an open vessel, as is here used, the vapors can readily diffuse into the surrounding air as fast as they are formed ; while in a closed vessel this diffusion is prevented the more closely the oil surface is covered. These “ Open Testers ” are the apparatus generally used by the oil refiners, more especially III, to determine, not the flashing point or temperature at which vapors are formed that make explosive mixtures with air ; but the burning point or temperature at which the oil itself takes fire, usually called by the high-sounding but fearfully misleading name of “ Fire Test.”

As is stated later it is possible to show that an oil that will not flash below (say) 120° Fahrenheit in an “ Open Tester,” is nevertheless, giving off inflammable vapors twenty degrees below this temperature. Since, therefore, these open apparatus do not show us the temperature at which vapors are first formed, they are entirely untrustworthy for determining the safety of kerosene oil.

**APPARATUS IN WHICH THE OIL SURFACE IS MORE OR LESS COVERED —
THE “ CLOSED TESTERS.”**

In regard to the “ Closed Testers ” the variations in results are principally due to faults in construction. In some cases the amount of water in the water-bath is so small that the oil gets heated too quickly and the flashing point is lowered beyond fairness.

In another case the cover of the oil-cup becomes overheated from the flash-jet and heats the surface of the oil. But by far the most important fault is the too small quantity of the oil used in the oil-cup. In most apparatus, both open and closed, the quantity of oil used is about two fluid ounces (60 c. c.) and the experiments with the above-named apparatus have proved that with Closed Testers, the more oil in the oil-cup, the lower the flashing point. And when we remember that an ordinary kerosene oil lamp holds about twelve fluid ounces (400 c. c.) of oil, a test with only two ounces is by no means a fair one. As a proof that this is true the experiments with apparatus VI and X bear witness. In the first of these (a poorly-constructed tester and loosely closed) the oil cup holds about eight ounces, and the flash point of No. 1 oil is 107° Fahrenheit ; while with the last of the above mentioned apparatus where over ten ounces of oil were used, the flash point is only 95° Fahrenheit.

From a careful consideration of all these experiments the following conclusions may be drawn.

An oil tester should be of such construction that the oil vessel shall hold as much oil as is used in an ordinary kerosene lamp (say ten ounces); the apparatus for heating the oil shall consist of a water-bath capable of holding enough water that the oil in the oil vessel shall not rise more than two or three degrees Fahrenheit per minute, when the water-bath is heated with a small spirit-lamp. The oil vessel should be closely covered and a means of ignition should be used that will ignite the vapors formed without heating the oil surface. Finally the thermometer should be accurate and of that type which has the degrees engraved directly on the stem, sufficiently far apart to be read with ease, and with a milk-glass back-ground.

GENERAL CONCLUSIONS.

Of all the apparatus examined not one can be called perfectly satisfactory. Of the better class of these instruments Mann's apparatus must be given the first place; then comes the Wisconsin State tester, which with a few changes would make the most satisfactory instrument to be placed in the hands of an inspector. The changes necessary in this instrument are:— First, increase of capacity of both water and oil vessels, and secondly, a glass or partly glass instead of a copper cover. Of the various other apparatus examined little need be said beyond what is stated in the examination of each. Of the electric testers it may be stated that any advantages obtained from the use of electricity is more than overcome by the trouble necessary to maintain the galvanic battery and induction coil.

II. EXPERIMENTS.

In the examination of the various apparatus now in use for the purpose of testing kerosene oil, the first step was a comparison of all the thermometers used, with a normal thermometer made by Green of New York. This normal thermometer was tested, and it gave 212° as the boiling point of water in a copper-vessel and 32.7° as the point at which ice melted.

Of fifteen thermometers compared with the normal one, only six were found accurate, and some of them varied as much as two degrees of Fahrenheit scale. These thermometers were sold with the apparatus used, and had a variety of forms; but the majority were of the type with an exterior glass tube and a paper scale of degrees. The thermometers with exterior glass tubes are very sluggish in the movement of the mercury and are not suited for testing kerosene oil; more especially if the temperature to be noted is near the flashing point of the oil.

Thermometers with ivory or metallic scales of degrees attached to the thermometer tube are entirely unreliable and should not be used where

even a moderate degree of accuracy is needed. They are usually so constructed that the scale can easily be unintentionally displaced many degrees.

The most satisfactory thermometer to use is one with the degrees engraved directly upon the glass stem that carries the mercury, such glass stems having a strip of milk glass at the back, in order that the height of the mercury may be the more easily seen.

The merits of each apparatus examined will now be discussed in as much detail as necessary beyond that given in the various tables of experiments.

CONDITIONS OF EXPERIMENTS.

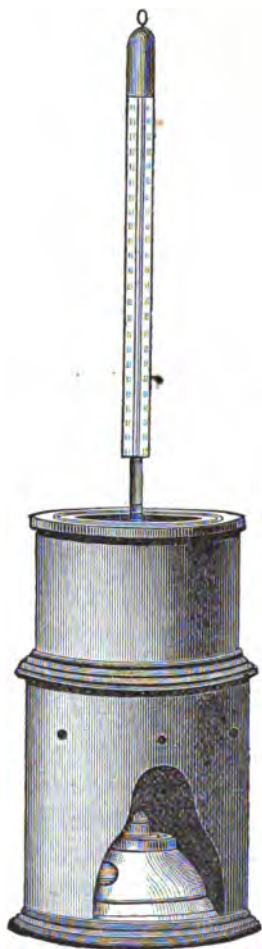
The various tests were made with as near the same conditions as possible, any variations being noted in the tables under the head of "Remarks." For the purpose of comparison each apparatus was tested with four different oils marked No. 1, No. 2, No. 3, No. 4. The oils Nos. 1 and 3 were the best sold in New York city, and No. 2 was pale amber colored oil, purchased at a small store on Second avenue, while No. 4 was a mixture of No. 2 with petroleum naphtha to reduce the flashing point.

I. TAGLIABUE'S OPEN TESTER.

This is one of the oldest forms of apparatus used for testing kerosene oil; it is of the simplest construction, and consists of a reservoir to hold the oil to be examined, which sets in another vessel holding water. The vessel containing water is heated by means of a small spirit lamp surrounded by a metallic case which protects the flame from draughts of air. The means of ignition are left to the discretion of the operator, except that a small flame must be used. A very good flame is obtained by using an ordinary wooden tooth-pick, or better still a small gas-jet from a glass tube drawn to a fine point. In my experiments with this tester, I used either the tooth-pick or gas-jet as was most convenient, generally the latter, for this part of the manipulation does not affect the results to an appreciable degree.

The thermometer when hung upon the wire standard rising from the side of the apparatus, dips into the oil until the level of the latter is about a quarter of an inch above the mercury bulb.

The accompanying table exhibits the experiments made with this apparatus and the results obtained, with the conditions under which each experiment was made.

Tagliabue's Open Tester.

I. Tagliabue's Open Tester.

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 1.....	48	85	87	85	225	60	5.0	105	15	1	Oil stagnant.
No. 1.....	do	do	do	do	do	do	6.0	105	16	2	Oil stagnant.
No. 1.....	do	do	do	do	do	do	4.4	110	18	3	Oil stagnant.
No. 1.....	do	do	do	do	do	do	4.1	110	15	4	Oil stagnant.
No. 1.....	do	83	83	83	do	do	5.3	106	15	5	Oil stirred.
No. 1.....	do	do	do	84	do	do	4.8	110	15	6	Oil stirred.
No. 2.....	45	70	71	75	do	do	4.8	107	15	13	Oil stagnant.
No. 2.....	do	78	79	78	do	do	6.7	109	15	14	Oil stagnant.
No. 2.....	do	78	79	79	do	do	4.6	110	15	15	Oil stagnant.
No. 2.....	do	78	79	79	do	do	7.5	112	15	16	Oil stirred.
No. 2.....	do	78	79	79	do	do	6.2	113	15	17	Oil stagnant.
No. 2.....	do	81	88	81	do	do	4.6	112	15	28	Oil stagnant; copper oil cup used.
No. 2.....	do	81	88	81	do	do	5.0	115	15	29	Oil stagnant; copper oil cup used.
No. 2.....	do	81	88	81	do	do	7.1	111	19	30	Oil stagnant; copper oil cup used.
No. 3.....	48	65	65	64	do	do	2.4	118	23	128	Oil stagnant.
No. 3.....	do	62	62	61	do	do	1.6	119	35	129	Oil stagnant.
No. 3.....	do	63	62	63	do	do	1.8	119	36	130	Oil stagnant.
No. 4.....	45	63	63	63	do	do	2.0	94	18	131	Oil stagnant.
No. 4.....	do	63	63	63	do	do	2.0	96	19	132	Oil stagnant.
No. 4.....	do	62	62	61	do	do	1.9	97	22	133	Oil stagnant.

SUMMARY.

In using this apparatus, a measured quantity of water was placed in the water bath each time an experiment was made, and the oil cup was filled with enough oil to cause the bulb of the thermometer to be immersed about half an inch, the oil being measured each time. The flame of the spirit lamp was adjusted as well as possible to regulate for slow heating. In most of the experiments, the glass oil cup was used; but in some cases a copper one was substituted. The flash jet was either a small well-lighted match like a tooth-pick or a quarter-inch gas-jet from a fine glass tube, which was found to be neatest.

It will be noted from the experiments with the various oils, that rapid heating tends to lower the flash point, and with this apparatus it is very difficult to obtain a flame on the spirit lamp that will be small enough to heat the oil slowly. This difficulty with rapid heating is due to a too small quantity of water in the water-bath.

The material of which the oil cup is made, whether metal or glass, does not appear to have any very decided effect upon the results obtained by this apparatus. If the oil is stirred or stagnant there is no greater variation in the flash point than between experiments under the same conditions. In using this apparatus in a very quiet room, with a dark back-ground to the apparatus and the light coming from a side-window, it was noted that a sharp blue halo appeared around the flash-

flame about twenty degrees below the flash-point of the oil under examination. This phenomenon was noticed repeatedly and was always seen within a few degrees of the same temperature when the same oil was used. It is best noticed when a small gas-jet is used to flash the oil, and at about a quarter of an inch from the oil surface. It is not a permanent effect, due to any local heating of the oil, but is an enlargement of the flash-jet for a moment, due to the presence of inflammable vapor mixed with the surrounding air, but in too small quantity to ignite unless prevented from diffusing.

II. ARNABOLDI'S OPEN TESTER.

This apparatus is very much like Tagliabue's Open Tester; but it holds more water in the water bath and more oil in the oil cup than that apparatus. Another important feature of this apparatus, is the attachment on the side of the water bath which holds oil and has an arrangement by which a very small flame can be brought within a prescribed distance of the surface of the oil. In fact, it has a mechanical ignition attachment by means of a small oil-jet which is adjustable. There is another small oil lamp that goes with the apparatus but not attached; it can be used as a flash-jet. The results obtained by this apparatus are given in the following table:

II. Arnaboldi's Open Tester.

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 1....	48	81	83	83	270	80	5.6	118	15	7	Oil stagnant; flashed with fixed jet.
No. 1....	do	do	do	do	do	do	3.3	118	15	8	Oil stagnant; flashed with fixed jet.
No. 1....	do	75	71	75	do	do	3.3	116	15	9	Oil stagnant; flashed with detached jet.
No. 1....	do	78	71	79	do	do	5.6	118	15	10	Oil stagnant; flashed with detached jet.
No. 1....	do	do	do	do	do	do	4.0	118	15	11	Oil stirred; flashed with detached jet.
No. 1....	do	77	71	77	do	do	5.8	116	15	12	Oil stirred; flashed with detached jet.
No. 2....	45	78	79	79	do	do	6.0	118	15	18	Oil stagnant; flashed with fixed jet.
No. 2....	do	do	do	do	do	do	3.6	122	15	19	Oil stagnant; flashed with fixed jet.
No. 2....	do	74	75	74	do	do	3.5	118	15	20	Oil stagnant; flashed with detached jet.
No. 2....	do	do	do	do	do	do	6.5	122	15	21	Oil stagnant; flashed with detached jet.
No. 2....	do	do	do	do	do	do	6.0	120	15	22	Oil stagnant; flashed with detached jet.
No. 2....	do	do	do	do	do	do	5.5	115	20	23	Oil stagnant; flashed with detached jet; therm'r $\frac{1}{4}$ " deeper.
No. 2....	do	do	do	do	do	do	3.3	122	20	24	Oil stagnant; flashed with detached jet; thermometer as No. 23.
No. 2....	do	75	do	75	300	100	3.1	122	15	25	Oil stagnant; flashed with fixed jet; used copper oil cup.
No. 2....	do	80	87	80	do	do	4.7	123	15	26	Oil stagnant; flashed with fixed jet; used copper oil cup.
No. 2....	do	do	do	do	270	80	3.7	121	15	27	Oil stagnant; flashed with fixed jet; used copper oil cup.
No. 4....	45	60	82	60	do	do	4.0	95	15	63	Oil stagnant; flashed with fixed jet; oil and water cooled.
No. 4....	do	do	78	do	do	do	3.3	97	15	64	Oil stagnant; flashed with fixed jet; oil and water cooled.
No. 3....	48	62	62	62	do	do	1.4	123	45	134	Oil stagnant.
No. 3....	do	do	do	do	do	do	1.6	122	40	135	Oil stagnant.
No. 3....	do	60	60	60	do	do	3.0	121	25	136	Oil stagnant.

SUMMARY.

What has been said in regard to Tagliabue's Open Tester is equally true of Arnaboldi's apparatus. It has one merit over Tagliabue's apparatus, in that it has a mechanical flash-jet which brings a small flame within a prescribed distance of the oil-surface, and in the same place upon that surface, every time it is desired to test the oil. But this does not appear to have any important effect upon the flash-point; for by using the detached jet sent with the apparatus, the same flash-points are obtained.

In this apparatus the water and oil were measured for each experiment, as in the case of Tagliabue's open apparatus.

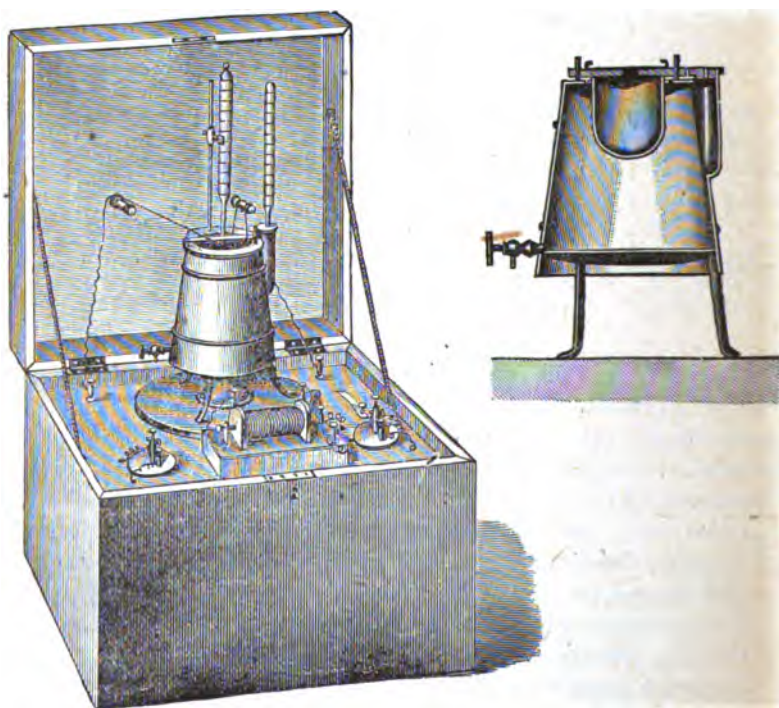
The larger quantity of water and oil used in this apparatus make it easier to heat the oil slowly, and therefore raises the flash-point of the same oil higher than with Tagliabue's apparatus.

III. SAYBOLT'S ELECTRIC TESTER.

In this apparatus, electricity is used as a means of igniting the vapors given off by a sample of kerosence. The outfit consists of a water-bath shaped like a truncated cone, a glass oil cup, an ebonite bar carrying two platinum wires, an induction coil, and two pint Grenet cells of a galvanic battery with the necessary wires for attachment. The ebonite bar rests upon the glass oil cup with the platinum wires upon the under side, and the cup is filled with oil to within an eighth of an inch of the platinum wires. There are two thermometers, one in the oil cup and another in the water-bath. When the oil arrives at the desired temperature, a series of sparks are made to pass between the platinum wires by means of a key which serves to make and break the circuit between the battery cells and the induction coil.

The following table gives the details of results obtained with this apparatus:

Saybolt's Electric Tester.



III. Saybolt's Electric Tester.

OIL USED.	Density, degree Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 2....	45	80	84	81	880	60	1.8	134	30	31	Thermometer $\frac{1}{2}$ in. deep; spark $\frac{1}{2}$ in. from oil.
No. 2....	do	do	83	do	do	70	2.1	123	30	32	Thermometer $\frac{1}{2}$ in. deep; spark $\frac{1}{2}$ in. from oil.
No. 2....	do	do	do	do	do	60	2.6	133	30	33	Thermometer $\frac{1}{2}$ in. deep; spark $\frac{1}{2}$ in. from oil.
No. 2....	do	do	do	do	do	70	2.7	125	30	34	Thermometer $\frac{1}{2}$ in. deep; spark $\frac{1}{2}$ in. from oil.
No. 3....	48	79	81	81	do	do	2.5	126	30	35	Thermometer and spark as No. 34
No. 3....	do	do	do	do	do	do	2.5	121	30	36	Thermometer and spark as No. 34
No. 3....	do	do	do	do	do	do	2.6	121	30	37	Thermometer and spark as No. 34
No. 3....	do	do	82	83	do	do	3.6	124	30	38	Thermometer and spark as No. 34; oil cooled.
No. 3....	do	do	do	63	do	do	2.5	122	30	39	Thermometer and spark as No. 34; oil cooled.
No. 4....	45	80	81	80	do	do	2.5	98	20	44	Thermometer and spark as No. 34
No. 4....	do	do	do	do	do	do	2.4	102	20	45	Thermometer and spark as No. 34
No. 4....	do	do	do	do	do	do	2.3	97	20	46	Thermometer and spark as No. 34
No. 4....	48	do	do	do	do	do	3.0	120	30	47	Thermometer and spark as No. 34
No. 1....	do	do	82	do	do	do	3.1	124	30	48	Thermometer and spark as No. 34
No. 1....	do	do	83	do	do	do	2.6	120	30	49	Thermometer and spark as No. 34

SUMMARY.

As in the other cases before mentioned, the water and oil used in this apparatus were both measured for each experiment. The thermometer was always immersed in oil in the oil cup so that the bulb was about a quarter of an inch below the oil surface.

This apparatus has an advantage over the other open testers, in that it has a small fixed means of igniting the vapors, viz.: the electric spark. As will be seen by the table of experiments, the distance of the spark from the oil surface makes an important difference in the temperature of the flash point; but in practice, this is easily obviated by measuring the oil used.

The great difficulty with this apparatus is the fact, that you have to look after a galvanic battery with its corrosive liquids. And, furthermore, this battery is constantly changing its strength and consequently the intensity of the electric spark varies. In the experiments with this apparatus, it was also found that just at the moment when you wished the spark to pass between the platinum wires, it refused to do so; in fact the means of ignition are too uncertain for practical work. Although the apparatus works admirably when everything connected with the battery is fresh, after a few days it is not easy to adjust it to be sure to get a spark when you want it.

IV. TAGLIABUE'S SMALL CLOSED TESTER.

This is an apparatus with a cover containing a kind of short chimney and a couple of valves to let in air and cause the vapor to rise into the chimney, where a flame is applied. The valves are opened by depressing a spring with a rod passing through the cover of the oil cup. In this form of the apparatus, the oil cup is of metal and the thermometer is fitted into a heavy metal case which screws into the top of the cover and dips into the oil cup. When the cover carrying the thermometer is placed upon the apparatus, a sliding valve allows of the filling of the oil cup with oil. The water-bath is filled to an overflow hole, and heated by a small spirit lamp. When the oil arrives at the desired temperature, the flash is seen by applying a small flame in the chimney or box upon the cover and simultaneously depressing the valves in the cover to allow air to enter.

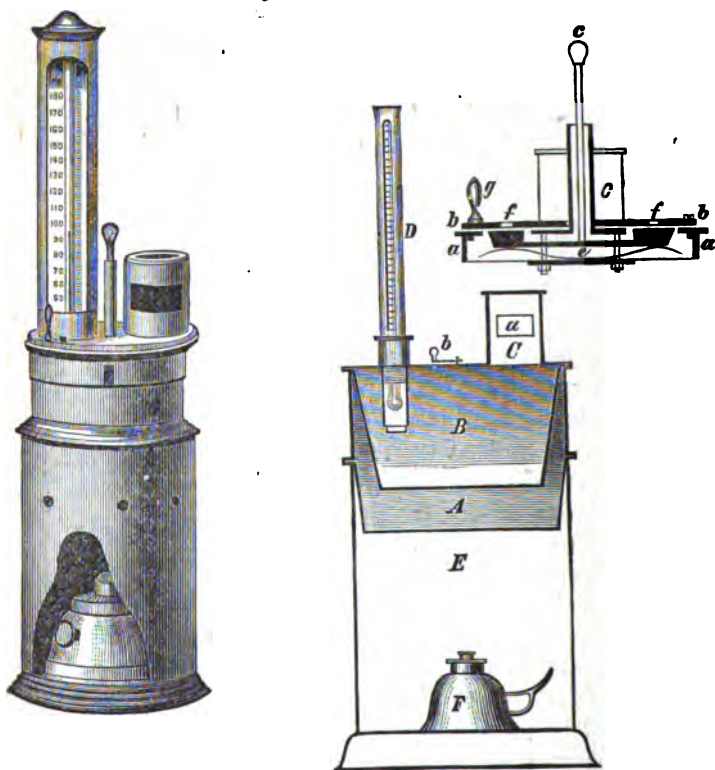
Tagliabue's Closed Tester.

Fig. 1. Exterior view.

Fig. 2. Shows section of old form, and also section of the valve mechanism of new form.

IV. Tagliabue's Small Closed Tester.

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 4....	45	76	74	74	50	75	4.0	90	6	105	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 4....	do	do	do	70	do	do	2.5	93	12	106	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 4....	do	60	77	67	do	do	2.5	90	10	107	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	45	60	77	70	do	do	3.5	110	14	108	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	do	54	do	68	do	do	3.4	114	16	109	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	do	53	do	72	do	do	3.3	115	15	110	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	48	62	60	63	do	do	2.2	112	18	137	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	do	60	60	60	do	do	2.0	113	20	138	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	do	62	60	62	do	do	3.3	112	18	139	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 1....	48	55	55	57	do	do	3.1	110	20	140	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 1....	do	52	52	54	do	do	5.1	111	15	141	Flashed with $\frac{1}{2}$ in. gas-jet.

SUMMARY.

The heavy metal of which this tester is made causes very rapid heating of the oil, and it is almost impossible to prevent this by any care in the manipulation. Another difficulty with this apparatus is the trouble necessary to clean the cover and valves between each sample of oil tested. In fact, the cooling of the apparatus and cleaning ready for a new test takes about fifteen minutes.

While using this apparatus, the enlargement of the ignition flame noticed with the open testers in a quiet room, is still more readily seen in the dark flash box of this tester, and at temperatures corresponding closely with those seen in the open tester with the same oil.

V. TAGLIABUE'S LARGE CLOSED TESTER

Is almost exactly like the small tester in design, but of larger dimensions; and the metallic oil cup is replaced by one made of glass. The method of testing is exactly the same as with the smaller tester.

V. Tagliabue's Large Closed Tester.

OIL USED.	Density, degrees Be at 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 4....	45	67	79	67	210	100	1.7	92	17	111	Flashed with + in. gas-jet.
No. 4....	do	65	do	70	do	do	1.3	94	20	112	Flashed with + in. gas-jet.
No. 2....	45	63	80	60	do	do	2.2	119	30	113	Flashed with + in. gas-jet.
No. 2....	do	59	do	65	do	do	2.54	118	30	114	Flashed with + in. gas-jet.
No. 1....	48	55	57	57	do	do	2.0	116	35	142	Flashed with + in. gas-jet.
No. 1....	do	58	57	57	do	do	2.6	117	28	143	Flashed with + in. gas-jet.
No. 3....	48	do	do	do	do	do	2.6	115	25	144	Flashed with + in. gas-jet.
No. 3....	do	do	58	58	do	do	1.4	118	44	145	Flashed with + in. gas-jet.
No. 3....	do	do	60	60	do	do	2.0	118	33	150	Flashed with + in. gas-jet.

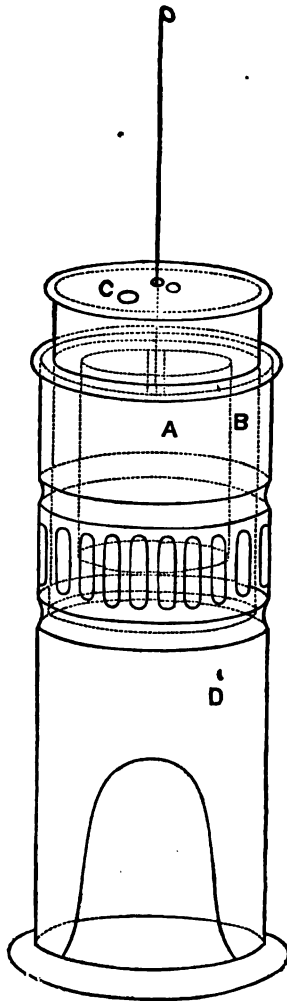
SUMMARY.

What has been said in regard to the small tester of Tagliabue, in the matter of weight of metal and valves, is equally true of the large apparatus. As will be seen from the table the quantity of water in the water bath is larger than in the small apparatus, and the rate of heating the oil is consequently more manageable.

VL. WISCONSIN STATE TESTER.

This apparatus consists of a water bath and a deep cylindrical oil reservoir, which is loosely covered with a copper plate through which passes the thermometer. This cover also has another hole through which the flame is applied to obtain the flash. It is of the simplest construction in copper, and the means of flashing are a small flame from a thin waxed thread.

Wisconsin State Tester — one-third actual size.



A. Oil cup. B. Water bath. C. Flash opening. D. Jacket.

VI. Wisconsin Tester.

OIL USED.	Density, degrees Be at 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 2....	45	75	82	73	215	240	5.3	105	10	95	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	do	do	77	78	do	do	2.8	109	12	96	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	do	78	78	do	do	do	2.0	110	18	97	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 2....	do	do	do	do	do	do	2.0	109	18	98	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 4....	45	76	74	73	do	do	1.6	86	10	99	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	do	do	do	70	do	do	2.0	85	10	100	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	48	76	74	70	do	do	2.4	109	18	101	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 3....	do	do	do	do	do	do	2.5	108	17	102	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 1....	48	76	74	72	do	do	2.5	107	16	103	Flashed with $\frac{1}{2}$ in. gas-jet.
No. 1....	do	do	do	70	do	do	2.5	106	16	104	Flashed with $\frac{1}{2}$ in. gas-jet.

SUMMARY.

Since this tester uses a comparatively large quantity of oil, it approaches the conditions that obtain in burning a kerosene lamp. Its management is simple, it is easily cleaned, and if it held more oil and had a closer cover, would be almost perfect as an oil-tester. The water bath also should hold more water in proportion to the oil used.

A slight difficulty arises in seeing the flash through the hole in the cover, owing to the reflection of the inside, which could probably be overcome by making the inside of the tester dark-colored. This is the only tester examined which has an adjustable wick to the spirit-lamp used for heating, a matter too important to be overlooked.

VII. ENGLISH GOVERNMENT TESTER—ABEL'S TESTER.

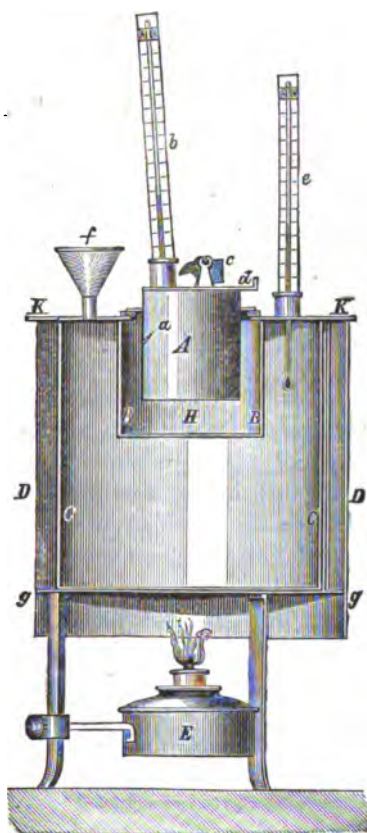
This is the apparatus used by the English government inspectors under the provisions of the Petroleum Act of 1879. The oil cup is a cylindrical vessel, two inches deep, and two and one-fifth inches high inside. The vessel has a close-fitting cover, which carries the thermometer and flash lamp. This cover is also provided with a sliding arrangement, which simultaneously opens three square openings in the cover, and also dips the flame of the flash lamp into the center opening by the same movement. This oil vessel has a filling gauge on the inside.

The oil cup and its attachments fit into an air bath, three inches in diameter and two and one-half inches deep, which in turn fits into a water bath five and one-half inches in diameter and five and three-quarter inches deep. A ring of ebonite prevents the contact of the ring of the oil cup with the top of the air bath, so that the heating

shall be only by means of air heated by the water bath. The water bath is provided with a thermometer, a funnel to fill it and an overflow gauge.

An outer case to surround the water bath and a spirit lamp complete the outfit. The results from this apparatus are seen below.

English Government (Abel's) Tester.



VII. English Government (Abel's) Tester.

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 4.....	45	78	83	82	2130	75	0.4	85	10	50	Flashed with oil-jet.
No. 4.....	do	99	83	58	do	do	2.0	76	10	51	Flashed with oil-jet.
No. 4.....	do	102	do	52	do	do	2.4	76	10	52	Flashed with oil-jet.
No. 4.....	do	100	do	52	do	do	2.0	78	10	53	Flashed with oil-jet.
No. 4.....	do	130	56	52	do	do	4.3	78	10	54	Flashed with gas-jet.
No. 4.....	do	do	do	do	do	do	4.0	75	10	55	Flashed with gas-jet.
No. 4.....	do	do	85	do	do	do	3.6	74	10	56	Flashed with gas-jet.
No. 2.....	45	do	85	54	do	do	2.6	102	20	57	Flashed with gas-jet.
No. 2.....	do	do	do	55	do	do	2.2	102	25	58	Flashed with gas-jet.
No. 2.....	do	76	82	do	do	do	2.4	102	20	59	Flashed with gas-jet.
No. 3.....	48	do	do	56	do	do	2.2	102	25	60	Flashed with gas-jet.
No. 3.....	do	do	do	do	do	do	2.2	102	25	61	Flashed with gas-jet.
No. 3.....	do	do	78	55	do	do	2.0	103	25	62	Flashed with gas-jet.
No. 3.....	do	do	79	do	do	do	1.7	106	30	63	Flashed with gas-jet.
No. 1.....	do	do	do	do	do	do	1.8	104	30	66	Flashed with gas-jet.
No. 1.....	do	do	85	do	do	do	2.2	102	25	67	Flashed with gas-jet.
No. 1.....	do	do	do	do	do	do	2.0	102	25	68	Flashed with gas-jet.

SUMMARY.

In using this apparatus, the water bath was filled till water ran out of the overflow tube; and the oil cup contained oil enough to just cover the point of the gauge in the interior. When an oil-jet is used to flash the vapor, it is extinguished in so doing; but when a gas-jet of the same size is used, this does not happen. When the little oil lamp attached to the cover of the oil cup is used as a means of ignition, the cover of the oil cup gets so hot that the hand can only, with difficulty, endure the heat of it. This heat can readily be communicated to the oil down the sides of the oil cup and cause a local overheating of the fluid.

When a gas-jet is used, this same trouble of heating the cover of the oil cup is also observed. This can be overcome by not lighting the jet until the temperature of the oil reaches a point a few degrees below the flash point; but even then the heat is communicated so rapidly through the gun-metal attachments on the cover, that there is a danger of overheating the upper portions of the oil. Perhaps a glass flash-jet would eliminate this difficulty.

In the directions for using this tester, the operator is told to heat the water bath to 130° Fahrenheit, and then place the oil cup, containing the proper quantity of oil, in position. When the oil begins to rise in temperature, the slider upon the cover of the oil cup is opened and the flame dips into the center opening while a pendulum

makes three beats. This appears to be an unnecessary amount of caution, since the results are just as concordant without any pendulum beats to guide the operator.

According to the English Petroleum Act of 1879, a flashing point of 73° Fahrenheit upon this apparatus is equivalent to 100° Fahrenheit with an open tester. In the apparatus used in the foregoing experiments it will be seen that this ratio is not quite fulfilled. But it is most remarkable that such a method of stating the results should be so recommended, in face of the fact that the oil gives off inflammable vapors at much lower temperatures than 100° Fahrenheit. It is a proof of the correctness of observations made elsewhere in this investigation, that open testers are worthless in determining the safety of kerosene oil.

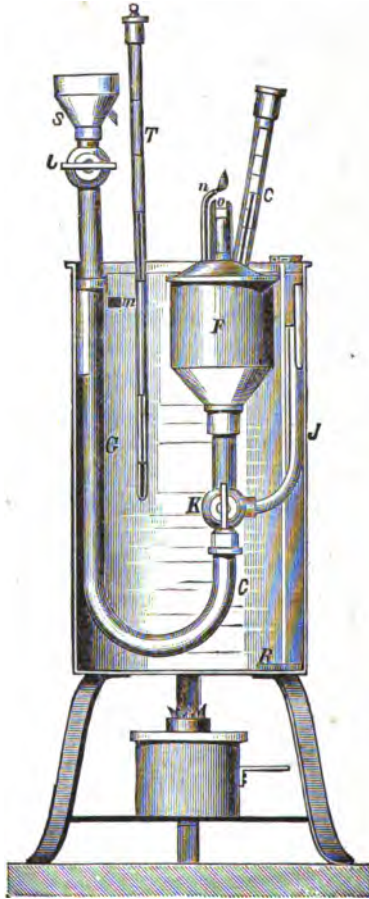
VIII. BERNSTEIN'S TESTER.

This apparatus is designed to show whether an oil does or does not give off an inflammable vapor at some given temperature. The outfit consists of a water bath, provided with an agitator and a spirit lamp, to heat it. Into this water bath is placed a somewhat complicated system of tubes and stop-cocks, very much like the letter U with the upper part of one limb enlarged. The enlarged part of the limb is used as an oil cup and the rest of the U is filled with water. Into the oil cup is placed a measured quantity of the oil to be tested, the stop-cock under the oil cup being previously closed. Water is now run into the other limb of the U, until it flows over a small tube communicating with the stop-cock. This serves to make the level of the water and oil the same in both limbs of the U when the stop-cock is opened. Into the top of the oil cup fits a cover, which carries two jets for oil; one of these jets is central and is surrounded with an annular space communicating with the interior of the oil cup, while the other jet is upon one side of this central tube. A funnel with a stop-cock fits into the narrow limb of the U, and also holds water when the stop-cock is closed. There are two thermometers, one in the oil cup and the other in the water bath.

The water bath without the system of tubes and oil cup is raised to the desired temperature by means of the spirit lamp. The system of tubes containing water and oil as described above are now placed in the water bath, and, the spirit lamp having been removed, the temperature of the oil is allowed to rise until it reaches that of the water bath the side jet upon the cover of the oil cup is now ignited, and by turning the stopcock of the funnel in the small limb of the U, the water runs down, raises the level of the oil in the oil cup, and thus forces the vapors up through the annular space of the cover into contact

with the jet which is immediately over it. As the vapors rise and are ignited by the side jet, they should also set fire to the jet within the annular space.

Bernstein's Tester.



VIII. Bernstein's Tester.

OIL USED.	Density, degrees Be at 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 1....	48	87	85	85	1300	55	1.8	130	30	69	
No. 1....	do	131	do	do	do	do	6.4	130	10	70	Water bath heated before tube with oil added.
No. 1....	do	135	86	75	do	do	8.0	128	6	71	Water bath heated before tube with oil added.
No. 1....	do	do	do	82	do	do	13.6	127	5	72	Water bath heated before tube with oil added.
No. 1....	do	do	do	do	do	do	8.8	130	6	73	Water bath heated before tube with oil added.
No. 4....	45	125	do	73	do	do	16.0	95	3	74	Water bath heated before tube with oil added.
No. 4....	do	122	do	75	do	do	10.0	90	3	75	Water bath heated before tube with oil added.
No. 4....	do	112	do	do	do	do	8.3	100	4	76	Water bath heated before tube with oil added.
No. 4....	do	108	85	74	do	do	12.5	99	3	77	Water bath heated before tube with oil added.
No. 4....	do	105	do	76	do	do	7.3	98	4	78	Water bath heated before tube with oil added.
No. 4....	do	125	do	74	do	do	17.3	90	3	79	Water bath heated before tube with oil added.
No. 4....	do	125	do	73	do	do	18.0	90	3	80	Water bath heated before tube with oil added.
No. 4....	do	do	do	75	do	do	13.0	88	3	81	Water bath heated before tube with oil added.
No. 4....	do	do	do	do	do	do	11.0	86*	3	82	Water bath heated before tube with oil added.
No. 4....	do	do	do	do	do	do	11.0	86*	3	83	Water bath heated before tube with oil added.
No. 3....	48	do	83	70	do	do	5.4	130	12	84	Water bath heated before tube with oil added; oil cooled in tubes.
No. 3....	do	135	do	do	do	do	6.0	130	12	85	Water bath heated before tube with oil added; oil cooled in tubes.
No. 3....	do	136	do	do	do	do	6.6	130	11	86	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	45	136	84	70	do	do	9.9	129	7	87	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	do	do	do	do	do	18.3	125	4	88	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	130	do	do	do	do	17.0	120	4	89	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	120	do	do	do	do	6.6	116*	8	90	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	125	do	do	do	do	4.6	125	14	91	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	80	82	do	do	do	1.8	130	36	92	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	132	do	do	do	do	6.4	128	11	93	Water bath heated before tube with oil added; oil cooled in tubes.
No. 2....	do	135	do	do	do	do	10.8	128	7	94	Water bath heated before tube with oil added; oil cooled in tubes.

* Oil would not flash at these temperatures.

SUMMARY.

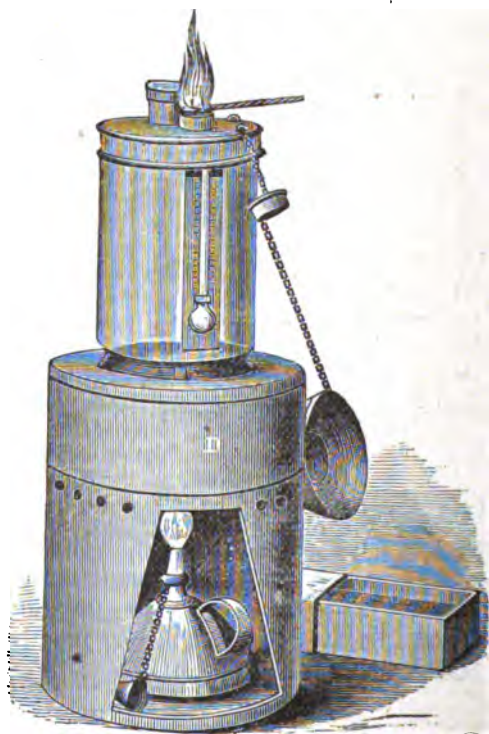
This tester is the most troublesome one used in the whole investigation. The system of tubes and stop-cocks is much too complicated for practical work and are quite difficult to manipulate rapidly. The ignited jet which serves to set fire to the vapors rising around the central jet, being made of thick metal, conducts heat very rapidly and the cover of the oil cup becomes quite hot from this cause. There is also great

difficulty in catching the flash point, owing to the rapid heating and the very great uncertainty of igniting the central jet, which is the index of the flash point. As in other testers, rapid heating lowers the flash point. It is often possible to see the vapors ignited by the side jet while the central jet refuses to take fire. As a consequence of these difficulties, and the uncertainty of the temperature at which the oil flashes, the results by this apparatus are much higher than with any other used, even open testers.

IX. MILLSPAUGH'S TESTER.

In this apparatus, the glass vessel that contains the oil stands about nine-tenths out of the water bath, only one-tenth of the lower part being immersed. The water bath is a cylindrical brass vessel, heated by a spirit lamp. The top of the glass oil cup has a rather loose cover with two holes in it; one of these holes opening immediately below the cover, and the other has a tube reaching about one-half inch lower down. A thermometer attached to the cover is immersed in the oil. The water bath is heated by the spirit lamp and the flash point obtained by removing the cap from the lowest outside opening and applying a small lighted match.

Millsaugh's Tester.



IX. Millsbaugh's Tester.

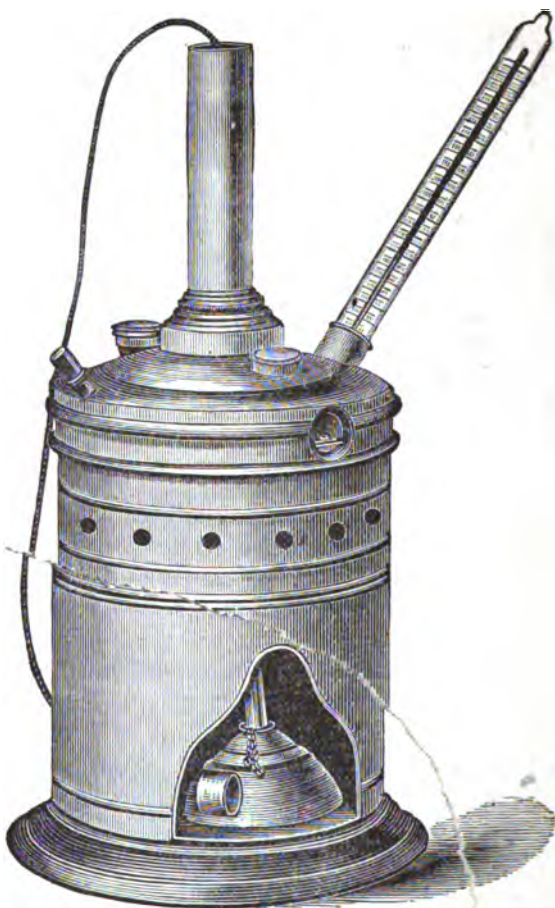
OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 2....	45	52	52	60	190	210	2.3	107	25	116	Flashed with + in. gas-jet.
No. 2....	do	do	do	56	do	do	2.9	108	25	117	Flashed with + in. gas-jet.
No. 2....	45	57	52	60	do	do	2.2	87	15	118	Flashed with + in. gas-jet.
No. 4....	do	62	56	63	do	do	2.0	81	12	119	Flashed with + in. gas-jet.
No. 4....	do	do	do	61	do	do	2.0	81	12	120	Flashed with + in. gas-jet.
No. 3....	48	56	56	60	do	do	2.8	108	20	121	Flashed with + in. gas-jet.
No. 3....	56	58	58	63	do	do	2.5	108	20	122	Flashed with + in. gas-jet.
No. 1....	57	57	57	58	do	do	2.5	110	25	146	Flashed with + in. gas-jet.
No. 1....	56	58	58	58	do	do	2.7	112	25	147	Flashed with + in. gas-jet.

SUMMARY.

We have here a tester where an effort has been made to prevent as far as possible the heating of the surface of the oil. But the looseness of the cover and the small space under it does not allow of the accumulation of vapor enough to detect the first quantities of it that are evolved by the oil; they are forced through the space around the cover and lost. Nevertheless this a step in the right direction since there is a larger quantity of oil used than in most testers, and a sufficiently slow means of heating. One very important fault with this apparatus is the immersed thermometer. When a sample of oil is white and clear there is no difficulty in reading the thermometer degrees; but with colored oils or those that are opalescent this becomes an impossibility. There is also much irregularity in the heating of the oil, owing to the small surface of the oil-cup exposed to the water-bath which causes convection in the oil.

X. MANN'S TESTER.

In this apparatus we come nearest to the conditions that obtain in an ordinary kerosene lamp. In fact the apparatus is essentially a metallic lamp in which the wick holder is replaced by a tube closed above by an india-rubber stopper. An opening at the side which closes from within by a little flap-valve serves for the introduction of a small flame for ignition. The thermometer is placed in a small tube closed below that is fixed down into the interior of the lamp. There are various openings in the top of the lamp serving to introduce the oil and as vents for the expanding gases within. There is a water bath with spirit lamp for heating to complete the outfit.

Mann's Tester.*X. Mann's Tester.*

OIL USED.	Density, degrees Be at 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	OIL.							
No. 2....	48	57	88	62	240	320	2.4	94	15	123	Blew up with $\frac{1}{2}$ in. gas-jet.
No. 3....	do	56	84	64	do	do	2.4	100	20	124	Not blown up but flashed.
No. 3....	do	50	84	64	do	do	2.0	85	18	125	Blew out valve not at plug.
No. 1....	48	50	73	56	do	do	1.7	96	28	126	Blew up.
No. 1....	do	do	70	53	do	do	2.6	93	18	127	Blew up, but faint.
No. 2....	45	56	60	60	do	do	1.8	93	22	144	Blew out at valve.
No. 2....	do	do	do	do	do	do	2.5	98	18	149	Apparatus filled with flame.
No. 4....	45	56	65	66	do	do	.7	75	16	151	Blew up.
No. 4....	do	do	do	do	do	do	.7	75	15	152	Blew out at valve.

SUMMARY.

The greatest fault of this apparatus is the fact that it is almost impossible to adjust the stopper in the tube so that it will blow out and not cause the flame to be ejected from the valve at the side. A larger water-bath would also be an improvement to this apparatus; and a better means of getting the flame into the lamp to ignite the vapor is also necessary.

This apparatus could be so modified as to cover almost all the requirements of a good tester.

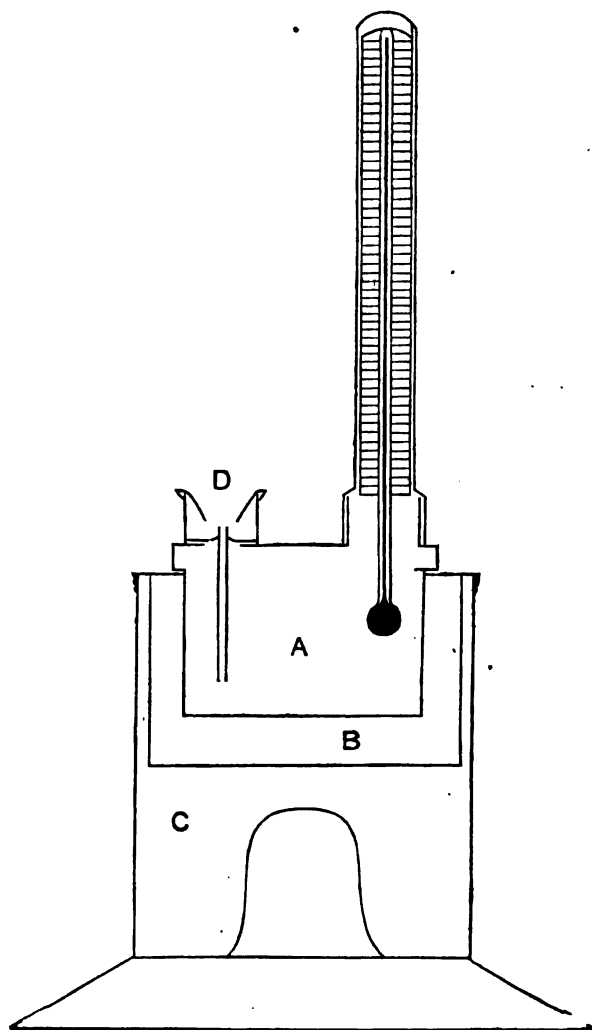
In using this tester it was noticed that sometimes the vapor had not force enough to drive out the stopper but the whole interior of the apparatus was filled with flame. It appears to be necessary to have just the right admixture of vapor and air to eject the stopper.

Another difficulty with this tester, which also applies to several others, is that the distance between the flame of the spirit-lamp and the bottom of the water-bath is too small and the cold metal often extinguishes the spirit-lamp by cooling the flame rapidly.

Since the thermometer is set into a tube closed at the lower end and only receives its heat by conduction through this tube and some oil into which it dips, this method of recording the temperature is objectionable as the rate of conduction is slow.

XI. FOSTER'S AUTOMATIC (OHIO STATE) TESTER.

In this, as in the other testers, we have a water-bath and oil cup. Both of these have good well defined filling gauges; and the oil-cup is covered. The horizontal cross sections of both water-bath and oil-cup are ellipses. In the cover of the oil-cup there are two openings; into one of these passes the thermometer leaving a space around it, and in the other is a tube carrying a wick which dips into the oil-cup. The wick in the small tube is ignited at a given temperature and causes a current down the space around the thermometer and up around its own flame. When vapor rises the jet ignites it and its explosion extinguishes the jet, thus becoming an index of the flashing-point of an oil.

Fosters' Automatic (Ohio State) Tester, one-third actual size.

Oil-cup has elliptical horizontal section and water-bath and outside jacket take the same form. A. Oil-Cup. B. Water-bath. C. Jacket. D. Flash jet.

XI. Foster's Automatic Tester (Ohio).

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimetres in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	Oil.							
No. 3....	48	56	58	56	240	250	2.1	116	32	155	Flash-jet lit at 100°.
No. 3....	do	do	do	do	do	do	1.9	115	34	156	Same as 155.
No. 3....	do	50	55	50	do	do	1.7	120	44	157	Flash-jet lit at beginning.
No. 3....	do	do	do	do	do	do	2.1	119	37	158	Same as 157.
No. 3....	do	do	60	62	do	do	2.3	112	30	159	Wick removed from flash-jet; used gas-jet.
No. 3....	do	61	65	60	do	do	1.9	110	31	160	Same as 159.
No. 3....	do	51	58	51	do	do	1.9	110	35	161	Same as 159.
No. 3....	do	60	75	70	do	do	1.5	124	39	162	Same as 157.
No. 3....	do	58	70	70	do	do	1.8	120	32	163	Same as 155.
No. 1....	48	57	80	70	do	do	1.9	121	31	164	Flash-jet lit at 100°.
No. 1....	do	60	80	72	do	do	2.0	119	28	165	Same as 164.
No. 1....	do	60	65	60	do	do	1.8	118	36	166	Same as 164.
No. 1....	do	do	do	do	do	do	2.1	119	32	167	Flash-jet lit at beginning.
No. 1....	do	do	68	63	do	do	2.0	119	32	168	Same as 167.
No. 1....	do	63	do	do	do	do	1.7	113	34	169	Wick removed from flash-jet; used gas-jet.
No. 1....	do	62	do	64	do	do	2.0	110	28	170	Same as 169.
No. 1....	do	57	do	63	do	do	1.9	110	29	171	Same as 169.
No. 4....	45	60	62	57	do	do	1.4	97	33	172	Flash-jet lit at 80°.
No. 4....	do	52	54	55	do	do	1.8	95	26	173	Same as 172.
No. 4....	do	55	83	68	do	do	1.6	95	21	174	Same as 172.
No. 4....	do	60	85	64	do	do	1.3	77	14	175	Wick removed from flash-jet; used gas-jet.
No. 4....	do	58	66	do	do	do	1.3	76	13	176	Same as 175.
No. 4....	do	60	72	do	do	do	1.3	76	13	177	Same as 175.

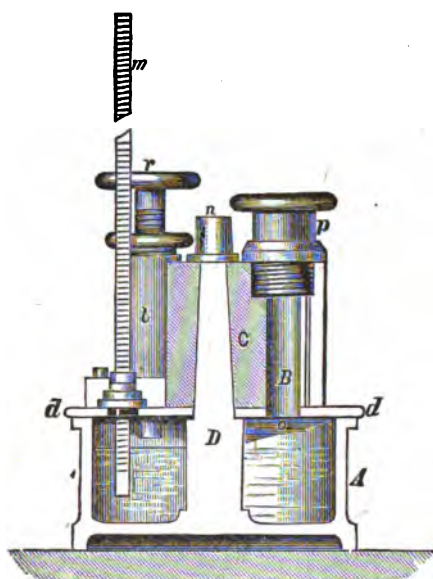
SUMMARY.

In using this tester some very important defects have been noted. In the first place, it does not matter much whether the flash-jet is lit at 100° Fahrenheit, as given in the directions, or at the beginning of the experiments; the results are not very concordant in either case, as may be seen from an inspection of the table. But what is more important than this is the fact that a lower flash-point can be obtained with this apparatus by not lighting the flash-jet and using a small ($\frac{1}{4}$ inch) gas-jet as a means of igniting the vapor. This was found to be true in every case, and goes to prove that the flame in the wick-tube of the apparatus simply causes a current over the surface of the oil, which carries off the vapors mixed with too much air to cause an explosion until they become of considerable density. This apparatus has some good points. It holds considerably more oil than oil testers generally; its well-defined filling guages are to be admired, and the adjustable spirit-lamp for heating the water-bath is too seldom seen with oil-testers to pass it without commendation. Nevertheless the apparatus fails as a safety oil-tester, since it is little better than an open tester, as can be seen from the experiments with it.

XII. SALLERON-URBAIN (PARIS) APPARATUS.

In his apparatus an effort has been made to ascertain the safety of kerosene oil by determining the tension of the vapor of a sample at a given temperature. It is claimed by the inventors that the lower the flashing point of the oil the greater the tension of its vapor at any given temperature. The apparatus consists of a shallow circular metallic vessel having a spindle in the centre, a cover through which passes a manometer tube and thermometer; this cover also contains two other openings. Upon the top of the cover a heavy metal tube is fitted, which works horizontally upon the spindle that passes several inches above the upper surface of the cover of the apparatus. This last tube is so arranged that by moving it through a small arc upon the spindle an opening below may be closed or opened at will. A solid plunger is fitted through another opening in the cover; and a screw cap to the heavy movable tube completes the apparatus.

To use this apparatus, the cover is placed upon the shallow vessel and contains the manometer tube, thermometer and plunger, all tightly screwed into stuffing boxes; upon the spindle is now placed the movable heavy tube in such a position that the opening into the cover below is free. By means of a pipette fifty cubic centimeters of water are run into the shallow vessel through the heavy metal tube, the tube is moved through its arc and the opening below closed. The tube itself is now filled with the oil to be tested, the cap upon the oil-tube screwed down tight, and the whole immersed in water till the thermometer reads fifteen degrees Celsius. At this temperature, the plunger is screwed down until the water in the manometer tube stands at zero. The oil tube is now moved back through its arc and the oil it contains falls into the water below, the column in the manometer tube rises and gives in millimeters the tension of the vapor of the oil for that temperature. From a number of experiments by the inventors, a tension of sixty-four millimeters of water at fifteen degrees Celsius is considered the minimum allowable for a safe oil.

Salleron-Urbain Apparatus.

A. Water reservoir. B. Oil-tube. M. Manometer. R. Plunger to adjust level in manometer.

XII. Salleron-Urbain (Paris) Apparatus.

OIL USED.	TEMPERATURE.		Tension of vapor in millimeters of water.	Reference number.	REMARKS.
	Degrees Centigrade.	Degrees Fahrenheit.			
No. 3.....	15.5	60	8	178	
No. 3.....	15.0	59	24	179	At 16°. 5 C. — 45 mm.; at 23°. 0 C. — 240 mm.
No. 3.....	15.0	59	6	180	At 19°. 0 C. — 138 mm.
No. 3.....	15.0	59	8	181	At 18°. 0 C. — 120 mm.
No. 1.....	15.0	59	14	182	At 16°. 0 C. — 45 mm.; at 16°. 5 C. — 64 mm.
No. 1.....	15.0	59	10	183	
No. 1.....	15.0	59	11	184	
No. 1.....	15.0	59	20	185	At 16°. 0 C. — 45 mm.; at 17°. 0 C. — 90 mm.
No. 4.....	15.0	59	59	186	
No. 4.....	15.0	59	24	187	At 16°. 0 C. — 45 mm.
No. 4.....	15.5	60	54	188	At 20 C. — 120 mm.
No. 4.....	15.5	60	56	189	At 17 — 94 mm.

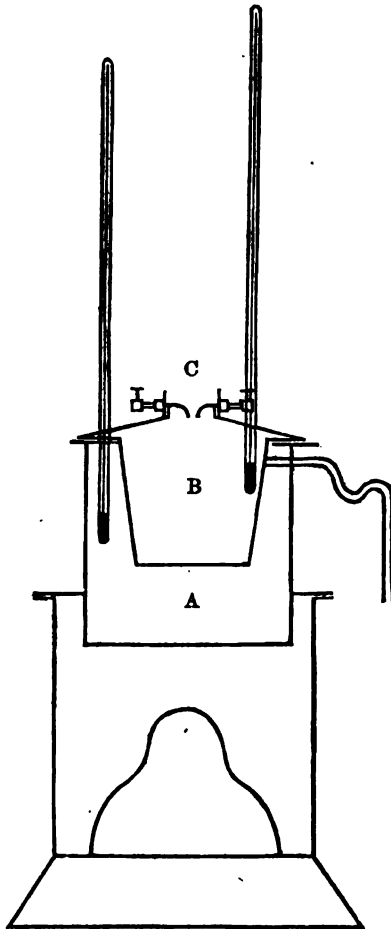
SUMMARY.

The aim of this apparatus is perhaps a good one, but the results of experiments with it are unsatisfactory. One of its worst faults is the absurdly small quantity (three cubic centimeters) of oil used for each experiment. Another difficulty is the constant fear that one of the many joints which it contains is leaking. A comparison of the tests obtained with this apparatus shows much discordance and the cause of this is not at all apparent since every care was taken that the

experiments should be successful. By comparing the number of millimeters of tension for every degree above fifteen Celsius, in the three oils used, we obtain the following results: No. 1 oil in experiment No. 182 showed in two readings an increase of 31 and 38 millimetres respectively for each degree rise; and in experiment No. 185 the same oil showed in two readings an increase of 25 and 45 millimetres respectively for the same rise of temperature. With No. 3 oil in experiment No. 179 two readings gave 14 and 30 millimeters respectively for every degree of rise in temperature; while in experiments Nos. 180 and 181 an increase of 33 and 37 millimeters respectively was obtained for every rise of one degree Celsius. In the same manner No. 4 oil gave in experiments Nos. 187, 188, and 189, an increase of 21, 14 and 25 millimeters respectively for every degree rise of Celsius. From these experiments it will be seen that the tensions of vapors obtained by this apparatus are too irregular and unreliable to make it a suitable instrument to be used to determine the safety of kerosene oil.

XIII. PEASE'S ELECTRIC CLOSED TESTER.

This is the only closed tester with an electric flash that could be obtained for this investigation, and it is the last one patented in the United States. It consists of the usual water-bath and oil-cup, together with a spirit-lamp for heating the water-bath. In the oil-cup there are some modifications not found in other testers. In the first place there is an over-flow tube to determine a constant level of the oil while heating; and secondly, the cover of the oil-cup which slides back and forth in a horizontal direction is slightly convex and has a short tube in the centre which carries the wires to give the electric spark: thirdly, the thermometer is fitted to a hinged valve which closes a slot in the cover, and this valve is pressed down upon the cover by a small catch. The spark is obtained from any induction coil that will give one a quarter of an inch long.

Pease's Electric (Closed) Tester.

A. Water bath. B. Oil-cup. C. Spark wires.

XIII. Pease's Electric Tester (Closed Test).

OIL USED.	Density, degrees Be, 60° F.	TEMPERATURE.			Cubic centimeters in water bath.	Cubic centimeters in oil cup.	Rate of heating, degrees per min.	Flashing point.	Time of experiment.	Reference number.	REMARKS.
		Water.	Room.	OIL							
No. 3....	48	52	58	56	300	110	2.1	156	50	190	Figures in flash column mean fire-test.
No. 3....	do	57	70	65	do	do	1.9	140	45	191	Flash obtained by wave of hand.
No. 3....	do	55	70	65	do	do	1.5	122	43	192	Spark would not flash; at 110 with gas-jet obtained flash.
No. 1....	48	55	90	68	do	do	1.4	150	62	193	Figures in flash column mean fire-test; at 108 flash with gas-jet.
No. 1....	do	54	74	64	do	do	2.1	152	46	194	Same as 193; at 112 flash with gas-jet.
No. 1....	do	58	do	70	do	do	2.1	116	27	195	Flash tube closed with glass plate.
No. 1....	do	53	do	68	do	do	2.1	117	29	196	Same as 195.
No. 1....	do	52	75	65	do	do	1.9	116	32	197	Flash tube covered as 195, except $\frac{1}{4}$ in.
No. 1....	do	do	do	66	do	do	2.0	117	31	198	Same as 197.
No. 4....	45	55	75	65	do	do	2.1	.....	34	199	No flash obtained, except with jet.
No. 4....	do	53	do	62	do	do	1.7	92	22	200	Flash tube covered with plate.
No. 4....	do	55	do	66	do	do	1.7	92	19	201	Same as 200.
No. 4....	do	61	do	64	do	do	2.1	145	43	202	No flash; oil took fire.
No. 4....	do	56	do	66	do	do	3.0	99	15	205	Flashed by lifting thermometer valve.
No. 4....	do	53	do	64	do	do	2.9	97	17	206	Same as 205.

SUMMARY.

The experiments with this apparatus go to prove that from its construction it is little better than an open tester. The overflow tube to the oil-cup is a good modification and insures the same and a constant level for every experiment. But the cover of the oil-cup does not fit tightly enough and the opening in the centre is too large ($\frac{3}{4}$ in.). Since the spark passes in the centre of the opening in the cover the vapors formed have a chance to get away around the sides of the opening, and very often a flash is not obtained until the oil itself takes fire. That the vapors do thus escape can be proved by flashing the oil with an eighth of an inch gas-jet pushed down the side of the flash-tube; and furthermore by covering the flash-tube with a small glass plate to hold the vapors a flash can be obtained at a much lower temperature. By simultaneously raising the valve of the thermometer opening when passing the spark, a flash can be obtained at about the same temperature, as the oil would flash upon an open tester. In fact the results obtained by this apparatus are not quite as good as those with Saybolt's Open Electric Tester, and like the latter it has the drawback of having a galvanic battery to be maintained.*

* Since the experiments with this tester were completed, the inventor has changed the opening that carries the spark wires, and made it much smaller, but I have not been able to make any experiments with this modified form. The device appears to be a good one.

Petroleum tests required in various States and foreign countries.

STATE OR COUNTRY.	Flashing temperature.	Firing temperature.	Igniting temperature.	Date of law.	APPARATUS USED.
Canada.....	95	.....	.....	.....	Abel's apparatus without change.
England.....	100	.....	.....	1879	Abel's apparatus, in which a flash at 73° F. — 100° on open tester.
France.....	95	.....	.....	1873	No apparatus mentioned.
Georgia.....	.....	110	.....	1870	Very rough test with saucer.
Illinois.....	.....	150	.....	1874	Tagliabue's Testers.
Indiana.....	120	.....	.....	1874	State Tester.
Iowa.....	.....	100	.....	.....	.....
Japan.....	.....	120	.....	1881	.....
Kentucky.....	.....	130	.....	.....	Standard instruments.
Louisiana.....	125	.....	.....	.....	Tagliabue's or approved instruments.
Maine.....	.....	120	.....	1867	Tagliabue's or some other accurate instrument.
Maryland.....	.....	110	.....	1871	.....
Massachusetts.....	100	110	.....	1869	Tagliabue's or other approved apparatus. Law under revision.
Michigan.....	120	.....	.....	1879	Special State apparatus.
Missouri.....	.....	150	.....	1879	.....
New Hampshire.....	.....	120	.....	.....	Tagliabue's or approved apparatus.
New York (City).....	100	.....	.....	.....	Tagliabue's Closed Tester.
Ohio.....	120	.....	.....	1880	Foster's Automatic Tester, or open tester described in law.
Pennsylvania.....	.....	110	.....	.....	Tagliabue's or approved tester.
Vermont.....	.....	.....	110	1868	Tagliabue's Pyrometer or other equally accurate instrument.
Wisconsin.....	.....	120	.....	1880	State Tester or Tagliabue's Open cup.
Rhode Island.....	110	.....	.....	1871	Tagliabue's Tester.
Sweden.....	104	.....	.....	1875	Open vessel.
Germany (Berlin).....	.....	.....	104	1867	Hannemann's Tester.

APPARATUS FOR TESTING INFLAMMABLE OILS PATENTED IN THE UNITED STATES.

PATENT No. 36,488. Apparatus for testing coal oil by J. Tagliabue, New York, Sept. 16, 1862. Claim for overflow holes on water bath, groove in oil cup to regulate height of oil, with glass wickholder, cork float and wire attached to side of oil cup. Essentially an open tester with floating flash-jet.

PATENT No. 36,826. Apparatus for testing coal oil by J. Tagliabue, New York, Sept. 1862. Claim for a closed apparatus with a chimney to ignite the vapors in. This is Tagliabue's well-known Pyrometer in its first form.

PATENT No. 35,184. Apparatus for testing coal oil and other mixed liquids, by H. J. Smith and W. Jones, Philadelphia, Pa., May 6, 1862. This is a partially closed tester with a flame over a cylindrical chimney, and the oil is heated directly in the oil cup without the use of a water bath.

PATENT No. 49,777. Petroleum tester by A. Millochau, Jersey City, N. J., Sept. 5, 1865. A rather shallow vessel with central section containing a wick which serves to heat and flash the oil. There is no water bath used.

PATENT No. 56,107. Carbon Oil Fire-tester, by G. E. Shaw, Pittsburgh, Pa., July 3, 1866. This is a partially closed tester, with a water-bath, two thermometers and a mechanical torch.

PATENT No. 104,798. Oil tester by P. H. Van der Weyde, New York, June 28, 1870. This appears to be a manometer apparatus for determining the vapor tension of inflammable oils.

PATENT No. 139,654. Apparatus for testing Hydrocarbon oils, by J. B. Blair, Philadelphia, Pa., June 3, 1873. Depends upon the unequal expansion of oils of different gravities.

PATENT No. 218,066. Electric oil tester by M. Saybolt, New York, July 27, 1879. An open tester with induction coil, bichromate battery and connections to give an electric spark at a given distance from surface of the oil.

PATENT No. 221,421. Kerosene oil tester by T. DeWitt Pinckney, Carmel, N. Y., Nov. 11, 1879. Appears to be a vapor tension apparatus ; but description is very indefinite and drawing bad.

PATENT No. 226,187. Electric oil tester by F. S. Pease, Buffalo, N. Y., April 6, 1880. This is a combination apparatus of open and closed tester, with electric spark to flash the vapors.

LITERATURE RELATING TO THE TESTING AND SAFETY OF KEROSENE OIL.

In this list will be found the names of books, pamphlets, and periodical articles relating to this subject ; and where practicable a brief synopsis of the contents is given. Where the same article is noticed in several journals the names of the latter are given, but the more easily accessible are given first.

1862.

Review of English Petroleum Act. In this act petroleum is considered to be any products giving off vapors below 100° F.
Chemical News, vol. vi, p. 169 :

1864.

Description of Parrish's Naphthometer. In this apparatus the vapors are made to pass into a chimney carrying a permanent flame. The oil is heated by a water bath ; and the flame becomes extinguished when the flash occurs, 38° C (102 F .) considered the limit of flashing point.

Wagner's Jahresbericht, vol. x, p. 675; also *Fresenius's Zeitschrift* 1864, p. 228:

1865.

Kurtz experiments on Parrish's Naphthometer. Author finds that with small flames of the same size for flashing, and equal rates of heating of the water, he obtains good concordant results with this instruments. The flash-jet used was three-quarters of an inch high.

Wagner's Jahresbericht, vol. xi, p. 749:

1866.

Essai des Huiles Minerales, M. M. SALLERON ET URBAIN. Authors consider as *essence* all oils of less density than .735, and *heavy oils* all above .820; those intermediate are *burning oils*. 2500 litres of oil distilled and samples taken among those constituting burning oils gave the following vapor tensions :

Density at 15° C.	Tension in m.m. of water.
.812	0
.797	5
.788	15
.772	40
.762	85
.756	125

Mixing the samples from the distillation they had a density of .800 at 15° C, and a vapor-tension of 64 m.m. of water.

Liquids inferior to .735 density or essence of patroleum gave the following results:

Density at 15° C.	Tension in m.m. of water
.735	410
.695	930
.680	1185
.650	2110

Authors recommended 64 m.m. at 15° C as highest tension allowable.

Annales des Genie Civil, vol. v, 1866, p. 154:

Notice of SALLERON-URBAIN vapor-tension apparatus. WAGNER says it is a modification of Pouillet's vapor-tension apparatus.

Wagner's Jahresbericht, vol. xii, p. 671:

T. T. KUCKLA, of Vienna, describes an instrument for testing petroleum very much like Parrish's Naphthometer.

Wagner's Jahresbericht, vol. xii, p. 673:

H. HAGER tests petroleum by distilling it in a bath of glycerine and dry crystallized calcic chloride at 125° C. From a good oil only a few drops of distillate come over.

Wagner's Jahresbericht, vol. xii, p. 674:

Also, *Fresenius's Zeitschrift*, 1866, p. 245:

J. ATTFIELD "On the igniting point of petroleum." A paper read before the British Pharmaceutical society. Objects to the use of an open vessel in testing petroleum since it does not conform to the conditions of a lamp. Recommends a large test tube and agitation to obtain a flashing point; with ignition flame not closer than half an inch from the oil surface. With the author flashing point is equivalent to an igniting point.

Chemical News, vol. xiv, p. 257:

1868.

DR. ROBERT PELKER "On the inflammability of petroleum and shale oils," gives the gravity of a number of petroleum products and the corresponding inflaming points. Also the same in regard to shale oils. *Dingler's Journal*, vol. clxxxix, p. 61:

T. ALLEN of Rhode Island uses an open vessel and water bath to heat the oil for testing. 115° F. given as the lowest ignition temperature allowable.

Wagner's Jahresbericht, vol. xiv, p. 729:

R. PELKER "On the inflammability of the different products of Pennsylvania petroleum." *See above*.

Wagner's Jahresbericht, vol. xiv, p. 732.

Also, *Dingler's Journal*, vol. clxxxix, p. 61:

M. AUG. JUENESSE "On the regulation of the mineral oil industry," shows that the minimum temperature of ignition is 55°-56° C. against 37.5° C. the minimum allowed in England for American petroleum.

Annales du Genie Civil, July, 1868, p. 493.

Also, *Dingler's Journal*, vol. cxc, p. 498.

Also, *Wagner's Jahresbericht*, vol. xiv, p. 734:

"*Examination of petroleum and other mineral oils*" by NORMAN TATE, London, Greenwood. Description and criticism of the examination of petroleum under the English petroleum act of 1868.

1869.

C. F. CHANDLER, PH. D. "Quality of the kerosene oil sold in New York city." Author gives composition of petroleum, remarks on the refining of petroleum, the quality of kerosene oil, and the fire test. In speaking of the last he says that 100° F. is too low a standard. He also gives tables showing the density, the vaporizing point and the burning point of the oils sold in New York city. There is also a table giving the percentage of naphtha in a number of oils, and another on the temperature of burning lamps.

Report to the Metropolitan Board of Health, Jan. 11, 1869. *Supplementary report*, Jan. 21, 1869. *Abstract in American Gas-Light Journal*, Feb. 21, 1869.

J. ATTFIELD On "uniformity in taking igniting points," contains remarks on the petroleum act (1868).

Chemical News, vol. xix, p. 70:

M. GRANIER "On rendering petroleum and paraffine oils uninflammable, etc.," in *Les Mondes* says 110° F. is too low for the flashing point and recommends 180° F.

Chemical News, vol. xx, p. 250:

1870.

C. F. CHANDLER, PH. D. "Report on dangerous kerosene." Author gives a number of tables showing a number of oils that would not pass either flash or fire test, or fire test alone. Also an account of the fires from kerosene in New York and Brooklyn. And a summary of the laws relating to kerosene oil. Author also makes some remarks upon the testing of kerosene, the apparatus used, the influence of time and other conditions.

Fourth Annual Report, Metropolitan Board of Health, 1869. New York, 1870, p. 437.

Reprinted, 8vo. pamphlet, pp. 23, New York, 1870.

B. H. PAUL, "Mode of testing mineral oils used for lamps." Criticizes the English petroleum acts of 1862 and 1868. Condemns open vessels for testing. Also notes the influence of rates of heating upon the flashing point. Acts of 1862 and 1868 require a flashing point not below 100° F. Author says that the more freely the oil surface is exposed, the lower the burning point; the less freely the oil surface is exposed the lower the flashing point.

Chemical News, vol. xxi, p. 2:

F. CRACE CALVERT, "On the testing of petroleum spirit" shows by experiments that prolonged testing raises the flashing point, allowing volatile products chance of escape. Also claims that the flashing point is raised by agitation which expels the light vapors. Also that depth of thermometer makes a difference in the flashing point. Author recommends to heat the water bath ten degrees above the flashing point (previously found approximately), then remove the source of heat; then place the oil cup in the water bath, with thermometer half an inch below the oil surface, and use a small gas-jet to ignite the vapors.

Chemical News, vol. xxi, p. 85:

A. ERNECKE and HANNEMANN, of Berlin, describe an open tester and place the firing point at not less than 120° F.

Wagner's Jahresbericht, vol. xvi, p. 707:

K. LIST of Hagen criticizes the English petroleum act apparatus of 1870. From his experiments he believes that size of spirit-lamp flame, quantity of water in the water bath and depth of thermometer have much influence upon the flashing point; as also does the time of the experiment.

Wagner's Jahresbericht, vol. xvi, p. 708:

1871.

C. F. CHANDLER, PH. D. "Report on petroleum as an illuminator." Author gives history of petroleum, composition and refining of petroleum, and cheapest process for making a safe oil. Also table showing: 1. Consumption of oil in lamps; 2. Illuminating power; 3. Temperature of burning lamps; 4. Flashing points of a number of oils bought in New York city. He also gives an account of the various apparatus then used for testing the oil; and full accounts of the laws relating to kerosene in the United States and England.

First Annual Report of the Board of Health of the City of New-York, 1871, p. 512. Reprinted 8vo pamphlet, pp. 110, New York, 1871. Abstract in *American Chemist*, vol. II, pp. 409 and 446; vol. III, pp. 20 and 41.

Also, *Wagner's Jahresbericht*, vol. xviii, p. 841

Also, *Dingler's Journal*, vol ccv, p. 578.

Dr. VAN DER WEYDE on "New test for kerosene oils" describes a simple apparatus to collect and measure the vapors given off from petroleum, and thus obtain its relative safety.

Scientific American, Sept. 1871, p. 162:

H. BYASSON, vapor-tension apparatus for determining the safety of petroleum.

Compte-Rendu, Sept. 4, 1871.

Also, *Wagner's Jahresbericht*, vol. xvii, p. 859.

Also, *Chemical News*, vol. xxiv, p. 167:

K. VON WEISE gives relation of flash to fire test and shows they are not proportional. Author warms oil in a glass cylinder half filled with it, by means of a water bath. 100 c.c. of oil are used and there is no cover on the vessel. Ignition of the vapors is obtained with a small gas-jet.

Wagner's Jahresbericht, vol. xvii, p. 865.

1872.

Experiments with Hannemann's tester in the Chemical works of Eisenbützel (Braunschweig), contains a table showing there is no relation between the flash and fire tests.

Wagner's Jahresbericht, vol. xviii, p. 846:

ED. MEUSEL describes an apparatus on the vapor tension principle, and says that it will show a half per cent of ligroine in petroleum.

Wagner's Jahresbericht, vol. xviii, p. 847:

1873.

GRANTIER's apparatus consists of a small closed vessel with a small opening in the lid, and two-thirds filled with oil. It has a wick-tube in the centre of the small opening in the lid. The wick is lighted and heats the oil and is extinguished by the explosion from the flash.

Bull. d. l. Société d'Encouragement pour L'Industrie Nationale, No. 247, July, 1873.

Also, *Chemical News*, vol. xxviii, p. 10 :

Text of the *Decree of the French Government* in regard to the sale and storage of petroleum. The oil is considered dangerous if emitting an ignitable vapor below 35° C. Versailles, May 19, 1873.

Journal de Pharmacie et de Chimie, vol. xviii, p. 236:

1875.

Dr. H. VOHL, of Cologne, "On petroleum as an illuminator," etc., gives a table showing: 1. Specific gravity of petroleum products at 15° R (18.75 c.); 2. Temperature at which ignitable vapors arise; 3. Percentage of essence (.74 s. g.) 4. Percentage of paraffine oil (.85 s. g.); 5. Consumption of oil in grammes in wick 18 m.m wide and 2 m.m thick, with a suction distance of 8 centimetres. Also gives photometric determinations compared with gas. Recommends 27.5° c-28.75° c as a flashing point limit.

Dingler's Journal, vol. ccxvi, p. 47:

1876.

H. B. CORNWALL, on "Kerosene oil," gives experiments on the removal of naphtha from various oils which raised the flashing point 2.27° F. for every per cent removed, and shows that the addition of like quantities of naphtha removed lowers the flashing point in almost the same ratio. Also shows that the burning point is not a reliable test of safety, since low flash oils inflame when the lamps containing them are spilled; and author gives a number of experiments proving this fact. Also shows that an oil flashing at 86° F. and burning at 107° F. can be made to flash at 100° F. by distilling off six or seven per cent of it.

Proceedings of American Chemical Society, June, 1876, vol. i, No. 1, p. 71.

R. S. MERRILL, on "Explosions and the methods of testing petroleum oil." Author describes the apparatus of S. S. Mann and says it is possible to show with it that kerosene oil is giving off inflammable

vapors ten to fifteen degrees below the flashing point and twenty-five to thirty degrees below the burning point.

Proceedings of the American Chemical Society, June, 1876, vol. i, No. 2, p. 115:

Report on Petroleum, by J. L. SMITH.

Author notices the open flash test and also Van der Weyde's vapor tension method.

Centennial Exhibition Reports Groups 3-7, Philadelphia, 1876.

1877.

Dr. CARL HEUMANN, "On heavy petroleum as an illuminator, etc.," gives a comparison of the distillation of different oils, their consumption in lamps, and light-giving power. Also some observations upon the danger of oil from easily inflammable vapors.

Dingler's Journal, vol. ccxxiv, p. 408 and 525:

Prof. F. A. ABEL'S "*Report to the Secretary of State for the Home Department on testing petroleum*," reports in favor of a closed vessel, and recommends a pendulum two feet long from the point of suspension to the centre of gravity, to beat three times while the flame is applied to flash the vapors from the oil. Prof. B. Redwood recommends metranome.

Chemical News, vol. xxxv, p. 73:

1879.

P. SCHWEITZER, PH. D. *Lecture on Petroleum*, delivered before a joint committee of the legislature of Missouri, Columbia, Mo. 1879.

Author mentions the dangers of low-grade oils, condemns the fire-test, and claims that the flash-test is the only reliable one.

H. HÖRLER, of Zurich. Review of Victor Meyer's work in Switzerland, "On the investigation and treatment of petroleum." Method of shaking oil with air after heating in a closed vessel, shows lower flashing point than in a partly closed tester. Size of shaking vessel and quantity of oil has no effect on the flashing-point. Author also gives table of experiments with burning lamps.

Dingler's Journal, vol. ccxxxiv, p. 52-61:

A. WAGNER, "Testing of petroleum and its danger from fire." Author uses the English, American and Berlin apparatus, (Ernecke

and Hannemann), and states that the American apparatus gives results 88-108 c above the English, which he prefers.

Wagner's Jahresbericht, vol. xxv, p. 1171:

M. ALBRECHT in Riga "On petroleum and its use as a lamp oil," Notes that in spite of the fact that petroleum should have a flashing point of 388 C (1008 F.) American petroleum is often found in commerce as low as 238 C. (748 F.)

Wagner's Jahresbericht, vol. xxv, p. 1173:

1880.

C. ENGLER describes a closed apparatus in which the electric spark is used to ignite the vapors, uses a double water bath and agitators to insure regular and uniform heating.

Die Chemische Industrie, No. 2, Feb. 1880:

R. HAAS describes a closed apparatus in which the oil is heated and shaken, while the ignition of the vapors is obtained by the electric spark.

Die Chemische Industrie, No. 4, April, 1880:

1881.

C. ENGLER and R. HAAS, on "The testing of petroleum for its safety."

Authors give a description of a number of experiments with typical apparatus. They reject all vapor-tension apparatus, as vapor tension and inflammability bear no relation to one another. Open testers are condemned as much too inexact. Of the closed testers they reject Tagliabue's, Sintenis and Parrish's naphthometer for faults in construction. Abel's apparatus is found to give too low results; while Bernstein's goes in the opposite direction. They claim that the most exact results come from the closed apparatus invented by themselves and in which the electric spark is used. Next to these they recommend Parrish's naphthometer as improved by Engler.

Fresenius's Zeitschrift, 1881, p. 1.

Also in *Sanitary Engineer*, New York, August, September, October, and November, 1881, abstracts by Dr. E. G. Love.

I cannot close this report without thanking Dr. E. G. Love and Mr. F. S. Pease for their courtesy in the loan of apparatus, etc. And to Prof. C. F. Chandler, I am especially indebted for his counsel, and the use of the suite of apparatus from the Chemical Museum of the School of Mines.

Chap. 292, Laws of 1882.

AN ACT to regulate the standard of illuminating oils and fluids for the better protection of life, health and property.

PASSED June 6, 1882 ; three-fifths being present.

SECTION 1. No person, company or corporation shall manufacture or have in this State, or deal in, keep, sell or give away, for illuminating or heating purposes in lamps or stoves within this State, oil or burning fluid, whether the same be composed wholly or in part of naphtha, coal oil, petroleum or products manufactured therefrom, or of other substances or materials, which shall emit an inflammable vapor which will flash at a temperature below one hundred degrees by the Fahrenheit thermometer, according to the instrument and methods approved by the State board of health of New York.

§ 2. No oil or burning fluid, whether composed wholly or in part of coal oil and petroleum or their products, or other substance or material, which will ignite at a temperature below three hundred degrees by the Fahrenheit thermometer, shall be burned in any lamp, vessel or other stationary fixture of any kind, or carried as freight, in any passenger or baggage car, or passenger boat moved by steam power in this State, or in any stage or street car drawn by horses. Exceptions as regards the transportation of coal oil, petroleum and its products are hereby made when the same is securely packed in barrels or metallic packages, and permission is hereby granted for its carriage in passenger boats moved by steam power when there are no other public means of transportation. Any violation of this act shall be deemed a misdemeanor and subject the offending party or parties to a penalty not exceeding three hundred dollars, or imprisonment not exceeding six months, at the discretion of the court.

§ 3. It shall be the duty of the State board of health of New York to recommend and direct the nature of the test and instruments by which the illuminating oils, as hereinbefore described, shall be tested in accordance with this act. It shall be the duty of the public analysts who may now be employed by the State board of health, or who may be hereafter appointed, to test such samples of suspected illuminating oils or fluids as may be submitted to them under the rules to be adopted by the said board, for which service the said board shall provide reasonable compensation at the first quarterly meeting of the State board of health held after the passage of this act; it shall adopt such measures as may seem necessary to facilitate the enforcement of this act, and prepare rules and regulations with regard to the proper methods of collecting and examining suspected samples of illuminating oils, and the State board of health shall be authorized to expend, in addition to all sums already appropriated for said board, an amount not exceeding five thousand dollars for the purpose of carrying out the provisions of this act. And the sum of five thousand dollars is hereby appropriated, out of any moneys in the treasury not otherwise appropriated, for the purposes of this section provided.

§ 4. Naphtha and other light products of petroleum which will not stand the flash test required by this act may be used for illuminating or heating purposes only :—

In street lamps and open air receptacles apart from any building, factory or inhabited house in which the vapor is burned.

In dwellings, factories or other places of business when vaporized in secure tanks or metallic generators made for that purpose in which the vapor so generated is used for lighting or heating.

For use in the manufacture of illuminating gas in gas manufactories, situated apart from dwellings and other buildings.

§ 5. It shall be the duty of all district-attorneys of the counties in this State to represent and prosecute in behalf of the people, within their respective counties, all cases of offenses arising under the provisions of this act.

§ 6. Nothing in this act shall be so construed as to interfere with the provisions of chapter seven hundred and forty-two of the laws of eighteen hundred and seventy-one, as regards the duties of the bureau of combustibles of the city of New York, or any other statutes not conflicting with this act, provided that nothing in this act shall be deemed to interfere with or supersede any regulation for the inspection and control of combustible materials in any city of this State made and established in pursuance of special or local laws or the charter of said city.

§ 7. All acts or parts of acts inconsistent with this act are hereby repealed.

§ 8. This act shall take effect sixty days after its passage.

NATURE OF THE TESTS AND INSTRUMENTS

BY WHICH

ILLUMINATING OILS SHALL BE TESTED.

Section 3, of chapter 292 of the Laws enacted by the last legislature, requires the State Board of Health of New York to recommend and direct the nature of the test and instruments by which the illuminating oils shall be tested.

Abstract of the law. SEC. 1. "No person, company or corporation shall manufacture or have in this State, or deal in, keep, sell or give away, for illuminating or heating purposes in lamps or stoves within this State, oil or burning fluid, whether the same be composed wholly or in part of naphtha, coal oil, petroleum or products manufactured therefrom, or of other substances or materials, which shall emit an inflammable vapor, which will flash at a temperature below one hundred degrees by the Fahrenheit thermometer, according to the instrument and methods approved by the State Board of Health of New York.

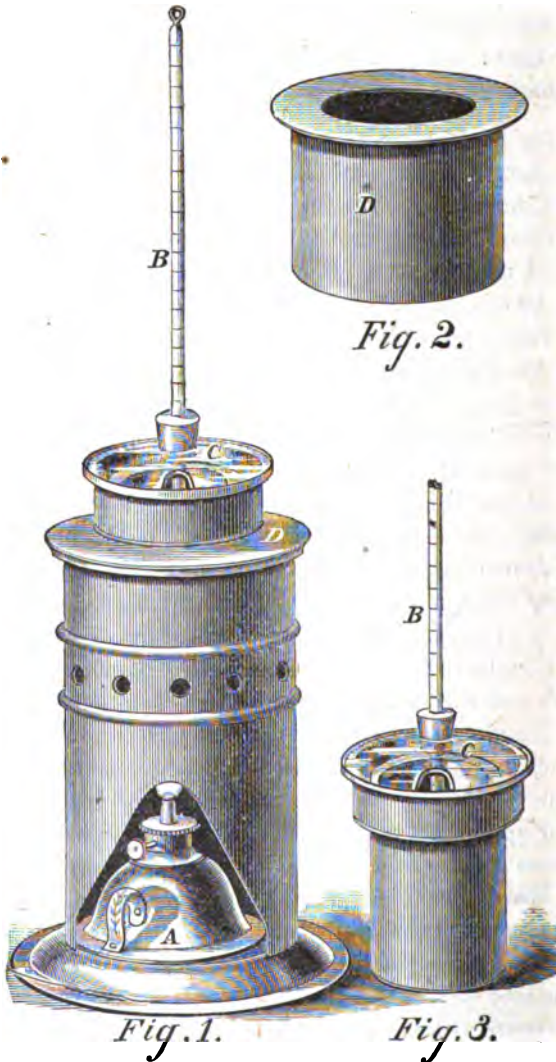
SEC. 2. "No oil or burning fluid, whether composed wholly or in part of coal oil and petroleum or their products, or other substance or material, which will ignite at a temperature below three hundred degrees by the Fahrenheit thermometer shall be burned in any lamp, vessel or stationary fixture of any kind, or carried as freight, in any passenger or baggage car, or passenger boat moved by steam power in this State, or in any stage or street car drawn by horses.

"It shall be the duty of the State Board of Health of New York to recommend and direct the nature of the test and instruments by which the illuminating oils, as hereinbefore described, shall be tested in accordance with this act. It shall be the duty of the public analysts who may now be employed by the State Board of Health, or who may be hereafter appointed, to test such samples of suspected illuminating oils or fluids as may be submitted to them under the rules to be adopted by the said board, for which service the said board shall provide reasonable compensation at the first quarterly meeting of the State Board of Health held after the passage of this act; it shall adopt such measures as may seem necessary to facilitate the enforcement of this act, and prepare rules and regulations with regard to the proper methods of collecting and examining suspected samples of illuminating oils."

At the quarterly meeting of the Board, held August 9th, it was *Resolved*, That for the purpose of carrying out the provisions of chapter 292 of the laws of 1882, the following rules be and hereby are adopted.

INSTRUMENTS AND TESTS.

(1.) The instruments to be used in testing oils which come under the provisions of section 1 of the law, shall be constructed as shown in the following diagram and description : *



* This instrument, in its original form, was devised and first employed by the Michigan State Board of Health; and a description of it will be found in its first annual report, 1878. The Wisconsin Board of Health afterward adopted the same instrument, and it is sometimes mentioned as the "Wisconsin tester." The apalysts of this State, acting upon the suggestions of Mr. A. H. Elliott, have made some changes which, in their opinion, will render the testing easier and more certain.

Fig. 1 represents the instrument entire. It consists of a sheet-copper stand $8\frac{1}{2}$ inches high, exclusive of the base, and $4\frac{1}{4}$ inches in diameter. On one side is an aperture $3\frac{1}{4}$ inches high, for introducing a small spirit-lamp, *A*, about 8 inches in height, or better, a small gas burner in place of the lamp when a supply of gas is at hand. The water bath, Fig. 2, is also of copper, and is $4\frac{1}{4}$ inches in height and 4 inches inside diameter. The opening in the top is $2\frac{1}{4}$ inches in diameter. It is also provided with a $\frac{1}{2}$ -inch flange which supports the bath in the cylindrical stand. The capacity of the bath is about 20 fluid ounces, this quantity being indicated by a mark on the inside. Fig. 3 represents the copper oil-holder. The lower section is $3\frac{1}{4}$ inches high, and $2\frac{1}{4}$ inches inside diameter. The upper part is 1 inch high and $3\frac{1}{4}$ inches diameter, and serves as a vapor-chamber. The upper rim is provided with a small flange which serves to hold the glass cover in place. The oil holder contains about 10 fluid ounces, when filled to within one-eighth of an inch of the flange which joins the oil cup and the vapor-chamber. In order to prevent reflection from the otherwise bright surface of the metal, the oil-cup is blackened on the inside by forming a sulphide of copper, by means of sulphide of ammonium.

The cover, *C*, is of glass, and is $3\frac{1}{4}$ inches in diameter; on one side is a circular opening, closed by a cork through which the thermometer, *B*, passes. In front of this is a second opening $\frac{1}{4}$ of an inch deep and the same in width on the rim, through which the flashing jet is passed in testing. The substitution of a glass for a metal cover more readily enables the operator to note the exact point at which the flash occurs. A small gas jet, $\frac{1}{4}$ inch in length, furnishes the best means for igniting the vapor. Where gas cannot be had the flame from a small waxed twine answers very well.

(2.) The test shall be applied according to the following directions:

Remove the oil cup and fill the water-bath with cold water up to the mark on the inside. Replace the oil cup and pour in enough oil to fill it to within one-eighth of an inch of the flange joining the cup and the vapor-chamber above. Care must be taken that the oil does not flow over the flange. Remove all air bubbles with a piece of dry paper. Place the glass cover on the oil cup, and so adjust the thermometer that its bulb shall be just covered by the oil.

If an alcohol lamp is employed for heating the water-bath, the wick should be carefully trimmed and adjusted to a small flame. A small Bunsen burner may be used in place of the lamp. The rate of heating should be about two degrees per minute, and in no case exceed three degrees.

As a flash torch, a small gas jet, $\frac{1}{4}$ inch in length, should be employed. When gas is not at hand employ a piece of waxed linen twine. The flame in this case, however, should be small.

When the temperature of the oil has reached 85° F., the testings should commence. To this end insert the torch into the opening in the cover, passing it in at such an angle as to well clear the cover, and to a distance about half way between the oil and the cover. The motion should be steady and uniform; rapid and without any pause. This should be repeated at every two degrees rise of the thermometer until the temperature has reached 95° , when the lamp should be removed and the testings should be made for each degree of temperature until 100° is reached. After this the lamp may be replaced if necessary and the testings continued for each two degrees.

The appearance of a slight bluish flame shows that the flashing point has been reached.

In every case note the temperature of the oil before introducing the torch. The flame of the torch must not come in contact with the oil.

The water-bath should be filled with cold water for each separate test, and the oil from a previous test carefully wiped from the oil cup.

(3.) The instrument to be used in testing oils which come under the provisions of section 2 of the law shall consist of the cylinder shown in Fig. 1 and the copper oil cup shown in Fig. 3, together with a copper collar for suspending the cup in the cylinder, and an adjustable support for holding the thermometer.

(4.) The test for ascertaining the igniting-point shall be conducted as follows: Fill the cup with the oil to be tested to within three-eighths of an inch of the flange joining the cup and the vapor chamber above. Care must be taken that the oil does not flow over the flange. Place the cup in the cylinder and adjust the thermometer so that its bulb shall be just covered by the oil. Place the lamp or gas burner under the oil cup. The rate of heating should not exceed 10° a minute below 250° F., nor exceed 5° a minute above this point. The testing flame described in the directions for ascertaining the flashing point should be used. It should be applied to the surface of the oil at every 5° rise in the thermometer, till the oil ignites.

(5.) The thermometers used for these tests should be compared, from time to time, with a standard thermometer, with special reference to the accuracy of the 100° and 300° marks.

COLLECTING AND EXAMINING SAMPLES.

(6.) The collection of samples shall be made under the direction of the sanitary committee, by the inspector or the public analysts. The samples, properly marked, shall be placed in the hands of the public analysts for examination, and the results reported to the sanitary committee.

(7.) Whenever an accident shall occur from the explosion or ignition of any oil on the premises of a consumer, it shall be the duty of the inspector to at once secure, if possible, a sample of the oil, and submit the same to one of the public analysts for examination, and to procure such evidence as to the source of the oil and the nature of the accident as may be necessary for legal proceedings.

PROSECUTIONS.

(8.) It shall be the duty of the inspector, with the advice of the sanitary committee, to bring to the attention of the district attorneys all violations of the law which may be discovered, and to furnish the evidence necessary to the prosecution. It shall also be the duty of the public analysts to serve as witnesses when required to do so.

SUPERVISION.

The supervision of this work has been entrusted to the Sanitary Committee of this Board.

Samples of oil, and inquiries relating to the subject of rules and testing, should be addressed to the Chairman of this Committee, Prof. C. F. CHANDLER, Columbia College, Forty-ninth street and Madison avenue, New York.

The foregoing regulations and service having been ordered by this board, the law is to be faithfully respected and enforced.

EDWARD M. MOORE, *President.*

ELISHA HARRIS, *Secretary.*

OFFICE OF THE STATE BOARD OF HEALTH OF NEW YORK, }
ALBANY, *August 12, 1882.*

REPORTS OF CHEMICAL ANALYSTS AND EXAMINERS, UNDER THE LAW FOR PREVENTING THE ADUL- TERATION OF FOOD AND DRUGS.

As provided and directed by the law known as, "An act to prevent the adulteration of food or drugs, chapter 407, passed June 8, 1881, the State Board of Health held a special meeting on the 23d of June to adopt such measures as seemed necessary to facilitate the enforcement of the act, and to prepare rules and regulations and appoint the necessary inspectors and analysts. The act is in the following words, namely:

"AN ACT to prevent the adulteration of food or drugs."

[Chapter 407, Laws of 1881.]

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. No person shall, within this State, manufacture, have, offer for sale, or sell any article of food or drugs which is adulterated within the meaning of this act, and any person violating this provision shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by fine not exceeding fifty dollars for the first offense, and not exceeding one hundred dollars for each subsequent offense.

§ 2. The term "food," as used in this act, shall include every article used for food or drink by man. The term "drug," as used in this act, shall include all medicines for internal and external use.

§ 3. An article shall be deemed to be adulterated within the meaning of this act—

a.—In the case of drugs.

1. If, when sold under or by a name recognized in the United States Pharmacopœia, it differs from the standard of strength, quality, or purity laid down therein.

2. If, when sold under or by a name not recognized in the United States Pharmacopœia, but which is found in some other pharmacopœia or other standard work on *Materia Medica*, it differs materially from the standard of strength, quality, or purity laid down in such work.

3. If its strength or purity fall below the professed standard under which it is sold.

b.—In the case of food or drink.

1. If any substance or substances has or have been mixed with it so as to reduce or lower or injuriously affect its quality or strength.

2. If any inferior or cheaper substance or substances have been substituted wholly or in part for the article.

3. If any valuable constituent of the article has been wholly or in part abstracted.

§ 7. Any violation of the provisions of this act shall be treated and punished as a misdemeanor ; and whoever shall impede, obstruct, hinder, or otherwise prevent any analyst, inspector or prosecuting officer in the performance of his duty, shall be guilty of a misdemeanor, and shall be liable to indictment and punishment therefor.

§ 8. Any acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

§ 9. All the regulations and declarations of the State Board of Health made under this act, from time to time and promulgated, shall be printed in the statutes at large.

§ 10. This act shall take effect at the expiration of ninety days after it shall become a law.

As directed by the Board at its meeting, June 23, the following circular of information and suggestion was issued :

CONCERNING THE LAW TO PREVENT ADULTERATION OF FOOD AND DRUGS.

OFFICE OF THE STATE BOARD OF HEALTH, }
ALBANY, June 25, 1881. }

The State Board of Health is required by this law to take cognizance of the interests of health as they relate to the sale of food and drugs, and the adulterations of the same. For this purpose it has undertaken the necessary investigations, and it now appeals to the people of the State for information and suggestions that may lead to the correction of wrong practices which the provisions of this law are designed to prevent.

Information and voluntary reports are specially desired concerning the following points :

In regard to Food-articles :—

1. Whatever is known or suspected of the adulteration of milk, condensed or uncondensed.

2. Whatever is known or suspected of adulterations and spurious materials sold as dairy butter.

3. Whatever is known or suspected of spurious or artificial liquids sold as wine.

4. Whatever spurious or adulterated substances are combined with or sold as sugar.

5. Whatever alkaline and other earthy substance is fraudulently sold as soda and its salts.

6. Whatever artificial mixtures are sold as baking powders, concerning which there is proof of injurious effects on health.

7. Whatever sugars, confections or other mixtures are known or believed to contain *terra alba*, or other earthy and mineral or metallic substances.

8. Whatever substances, mixtures or compounds recognized or sold as articles of food, drink, or medicine, are in, or to be placed in, the market for sale, and which are below the natural quality or strength, or which in the judgment of those concerned may be sold and used as articles of food, beverage or medicine, in accordance with the exemptions provided in sections 3 and 4 of chapter 407.

In regard to Drugs or Medicines:—

1. Whatever substances are known or suspected of any adulteration, or any depreciation from the *official* standards of the *Materia Medica*, and the *Pharmacopœia*, as designated in section 2, chapter 407, of the Laws of 1881.

2. Whenever a drug or compound, the composition of which is not established by a national pharmacopœia, shall be manufactured, offered and used in the State of New York, the standard ingredients of its composition and the range of variability from such standard or standards should be duly certified and officially filed at the office of the State Board of Health. There are medicinal compounds, of this kind, of such practical and extensive use, that their correct standards should be maintained by whoever makes and sells them.

This Board has appointed eight distinguished chemical analysts, located in various parts of the State, to serve under this law. Arrangements have been made for collecting the necessary samples of food-articles and drugs.

Whenever a citizen in this State desires to have samples of food or drugs tested, which are suspected of adulteration or other fault, he will please give notice by mail to Prof. Charles F. Chandler, chairman of the sanitary committee of this Board, under whose supervision the analyses and investigations are conducted, who will return his request, etc., concerning the same. The rules he will give in each case for procuring and sealing up samples for analysis should be followed.

Request.

All who are interested in promoting the welfare of life and health by guarding against adulterated and deleterious articles of food, beverages and medicine, will please carefully to observe and inquire concerning the illegal traffic in such articles; and this Board specially requests that whenever any person is cognizant of a case, or cases, in which there is, or seems to be, evidence of poisoning or injury from the use of any food-articles, beverages, drugs, condiments, and the accessories of food, information should be immediately given to the State Board of Health at its Albany office, and the reason for such opinion should be at once communicated, with the name of the informer. All such names and information will be so reserved, and the Board's action will be so directly responsible, that no inconvenience shall result to informants.

The State Board of Health desires the fact to be well understood by the public that this law originated as a national measure for the protection of the people, as recommended by the National Board of Health and National Board of Trade; and that in the State of New York its administration will be based upon effectual co-operation of the State Board of Health with the people and honest producers and tradesmen, and upon the faithfulness and skill of this Board's carefully selected chemical analysts.

On behalf of the State Board of Health,
ELISHA HARRIS, *Secretary*.

At its meeting in June this Board placed the supervision of all work connected with the Food and Drug Law under that subdivision of its members known as its Sanitary Committee; and on the 6th of July the chemists and examiners convened in the city of New York and entered upon organized work under the direction of said committee, of which Prof. Charles F. Chandler, of Columbia College, is chairman.

A definite rate of compensation was agreed upon and soon was accepted by the eight chemists thus engaged. Two expert inspectors were employed to gather samples for the use of the chemical analysts, and for ascertaining the facts relating to the substances used as foods, beverages and drugs. Subsequently a third expert inspector was employed.

E. H., *Secretary.*

REPORT OF THE SANITARY COMMITTEE OF THE STATE BOARD OF HEALTH ON THE ADULTERATION OF FOOD AND DRUGS.

By CHARLES F. CHANDLER, Ph. D., *Chairman.*

The Sanitary Committee makes the following report on the work performed during the past year in carrying out the provisions of chapter 407 of the Laws of 1881, entitled "An act to prevent the Adulteration of Food and Drugs;" passed May 28, 1881.

It was decided by the Board that the first step in carrying out the provisions of this act should be a careful examination of the food and drugs sold in different parts of the State in order to ascertain the nature and extent of the adulteration practiced; also to have carefully examined the methods of analysis in use for the detection of such adulterations, and to have presented for the use of those on whom the enforcement of the act would finally devolve the best literature on the subject.

For this purpose the different articles of food and drugs were divided into twelve groups, and these were assigned to chemists in different parts of the State for investigation and report.

The following list exhibits the classification :

ANIMAL FOOD.

I. Milk fresh and condensed. Assigned to C. F. Chandler, Ph. D., Columbia College, New York.

II. Butter, dairy and artificial; cheese; lard; olive oil; and fruit essences. Assigned to G. C. Caldwell, Ph. D., Cornell University, Ithaca, N. Y.

III. Canned meats and animal foods, fresh, smoked, salted, canned; extracts and essences of meat and fish; gelatine and isinglass. Assigned to A. H. Chester, Ph. D., Hamilton College, Clinton, N. Y.

VEGETABLE FOOD.

IV. Cereals, and the products and accessories of flour and bread foods, wheat, rye, barley and rice, oatmeal, corn-meal, sago, tapioca

and leguminous preparations, special artificial foods for infants and invalids, baking powders, cream tartars, bicarbonate of soda, bicarbonate of ammonia, alum powders and the "alum question." Assigned to E. G. Love, Ph. D., New York.

V. Canned fruits and vegetables, preserves, vinegar, pickles, mustard, ginger, spices, antiseptics employed in preserving, glazing and enamel as affecting food articles. Assigned to S. A. Lattimore, Ph. D., University of Rochester, Rochester, N. Y.

VI. Sugars, syrups, molasses, glucose, confectionery, honey, and soda-water-syrups. Assigned to W. H. Pitt, M. D., Buffalo, N. Y.

VII. Tea, coffee, cocoa. Assigned to S. A. Lattimore, Ph. D., University of Rochester, Rochester, N. Y.

VIII. Wines, beers, spirits and cordials. Assigned to F. E. Englehardt, Ph. D., Syracuse, N. Y.

DRUGS.

IX. Crude vegetable and animal drugs. Assigned to F. Hoffmann, Ph. D., New York.

X. Pharmaceutical chemicals and their preparations. Assigned to F. Hoffmann, Ph. D., New York.

XI. Gelatine and sugar-coated and compressed pills of quinine. Assigned to G. C. Caldwell, Ph. D., Cornell University, Ithaca, N. Y.

XII. Granular effervescent salts, fluid citrate of magnesia, seidlitz powders. Assigned to W. G. Tucker, M. D., College of Pharmacy, Albany, N. Y.

In addition to the chemists engaged in making these investigations it was found necessary to secure the services of two competent persons to gather the samples, and A. L. Colby, Ph. B., of New York, and T. Delap Smith, M. D., of Broadalbin, Fulton county, were appointed inspectors.

C. E. Munsell, Ph. B., of New York, was subsequently appointed an inspector, and to him was assigned the work of visiting the dairy regions, collecting information in regard to milk, and making analysis of samples.

Albert L. Colby, Ph. B., was requested to make a supplementary report on sugar.

Samples of food and drugs have been purchased from time to time and distributed among the analysts for examination, and the committee has the satisfaction of presenting herewith detailed reports embodying the results of this work.

GROUP I.

Milk, fresh and condensed, was referred to C. F. Chandler, Ph. D., with whom was afterwards associated C. E. Munsell, Ph. B.

The first part of the report is devoted to the composition of pure milk, and the most common frauds, which consist of watering, or skimming, or both. The frauds in milk differ from those of most other articles of food, in that pure milk varies in its composition in a very marked degree, making it impossible to establish a standard of purity, except by selecting the poorest milk produced by healthy cows for this purpose. As the frauds consist generally in increasing the amount of water, or diminishing the amount of fat (skimming) the

chemist can by his examination decide only whether the frauds practiced have reduced the original milk below the standard adopted.

The report then details the investigations by which the standard has been fixed.

The minimum specific gravity of 1.029, which has long been the standard in Europe, was confirmed by the examination of nearly one thousand cows in New York State, New Jersey and Connecticut. The maximum specific gravity was 1.0394 or 136 on the lactometer, the milk being from an Alderney cow. The lactometer employed, therefore, is the one in use in Europe on which 0 stands for the specific gravity, 1.000 or that of water, and 100 stands for that of 1.029 which is the specific gravity of the poorest normal milk from healthy cows. Thirty-eight analyses of pure milk were made by C. E. Munsell, and twelve more are quoted which were made by Elwyn Waller, Ph. D. The standard adopted by the English Society of Public Analysts and the New York City Board of Health is confirmed and adopted in this report. It is for the poorest milk from a healthy cow.

Fat.....	2.5
Solids, not fat.....	9.0
Water.....	88.5
	<hr/>
	100.0

From the examination of commercial milk it appears that the sophistications of this article of food are extremely common. While a large proportion of the milk sold has been but moderately watered and skimmed and is still above the standard of the poorest milk, much of the milk has been *extended* and skimmed far below this standard. So openly are these frauds practiced that "Creameries" have been established in many localities, the names and locations of 73 such establishments being known to the writers, of which 63 are known to send skimmed milk to New York city, all of which is sold as whole (pure) milk on its arrival.

Special attention was paid to the use of brewers' grains as food for cows. It is found that when these grains are used in moderate proportions with good pasture or hay, etc., and the cows are properly cared for, no evil results occur either in the quality of the milk or the condition of the animals. The excessive use, however, of this food has a very bad effect on the cows.

The condensed milk, as served to customers in New York city, was carefully analyzed and found to be unobjectionable, and of good strength, except in one or two cases, where the small percentage of fat showed that the milk must have been partially skimmed before it was condensed.

GROUP II AND XI.

To Professor G. C. Caldwell's care were submitted Group II, butter, etc.; and Group XI, gelatine and sugar-coated and compressed pills of quinine.

Forty samples of *butter* were examined: Of these, one appeared to be a mixture of butter and oleomargarine, one was adulterated with

water, five are considered suspicious, and 14 contain fatty matter other than genuine butter.

Of *cheese*, it appears that only one sample was submitted to examination which was said to produce sickness; the examination of this sample, however, failed to reveal any poisonous substance, and Prof. Caldwell concludes that the injurious action was probably due to an unknown organic substance resulting from an abnormal process of ripening.

Of *lard*, 28 samples were examined which varied greatly in color, texture and odor. Of these 15 contained no water, three had a little water while the rest contained water varying from 1 to 7.5 per cent. Aside from the question of adulteration, however, some of these could not be considered wholesome articles of food.

Olive oil.—Sixteen samples were examined, the tests being based upon the action of various chemical reagents on the oils. "To sum up the whole matter, while there may not be in the results of these tests, positive proofs of the presence of this or that foreign oil in particular there is fully sufficient proof of the adulteration of some kind."

Of the 16 samples, nine are considered as adulterated.

Besides the actual examinations, Prof. Caldwell's report contains a very valuable compilation of the best known methods of analysis of the different articles.

GROUP XI. Quinine in pills and compressed.

Prof. Caldwell's work in this direction was confined to the determination of the amount of quinine sulphate in the samples received without attempting to ascertain the extent to which other alkaloid of the bark are substituted for it to make up the deficiency where it exists.

Twenty-nine samples of quinine pills were examined, and it appears that in every case the amount of quinine sulphate was below that which it was professed the pill contained. Two grain pills were found to contain from 0.9 to 1.8 grains of the sulphate; the three grain pills contained from 1.7 to 2.8 grains, while the five grain pills contained from 2.4 to 4.7 grains.

GROUP III.

In the hands of Prof. A. H. Chester was placed Group III, canned meats and animal food.

After discussing the dangers and means of detection of trichinosis, in this report, meat extracts are considered, accompanied by 9 analyses of different meat extracts, being determinations of the water, the organic matter, ash, soluble albumin and alcoholic extract.

These extracts were found to be free of adulteration, unless the presence of gelatine and an undue amount of water can be so considered.

Then meat preserves are considered, under the heads of salting, smoking and canning.

Isinglass and gelatine are "indetical in composition and uses, but the isinglass is decidedly the finer, and therefore gelatine is often substituted for it in whole or part." Four samples were examined, two being sold as isinglass and two as gelatine, but all proved to be samples of gelatine.

GROUP IV.

Dr. Love, to whom were assigned bakers' chemicals, breadstuffs, etc., reports that of some 280 samples examined, only 35 were adulterated. The saleratus of commerce consists of the bicarbonate of soda instead of potash as was formerly the case. This salt as well as the bicarbonate of soda, sold under the name of baking soda, are generally free from adulteration. Cream of tartar, as sold by grocers, is adulterated to a great extent, the common adulterant being ground gypsum, the amount of which in several cases exceeds 50 per cent. Of 84 samples of baking powder examined, 58 per cent were what are known as cream of tartar powders, about 24 per cent were alum powders, while the remainder were tartaric acid and phosphate powders. Adulteration was reported in the case of eight powders.

In the examination of 117 samples of flour from various cereals, only eight were found to be adulterated, and of this number six were arrow-roots. Ten samples of bread were found to be of satisfactory quality.

Dr. Love considers the "alum question" at some length and concludes that at the present time there is not sufficient evidence as to the injurious action on the animal system of alum as ordinarily used, to warrant its prohibition. The addition of alum to damaged flour, however, is condemned on the ground that it permits the unscrupulous to use an article often unfit for human food.

GROUPS V AND VII.

Professor Lattimore had Groups V and VII in charge, Group V being canned fruits and vegetables; Group VII, tea, coffee, cocoa.

In Group V, 9 samples of canned fruit and the same number of canned vegetables were examined, and no indication of adulteration was found in any of them. The examination of the remainder of this group included the testing of vinegar, pickles and spices.

The vinegars, though all of inferior quality, were not adulterated, and of the pickles only one was found to contain any foreign ingredient, and that was alum.

The spices, however, of which 180 samples were submitted to investigation, show a great amount of adulteration.

Of the 180 samples, 112 were not the pure article, the percentage of adulteration being :

In Mustard.....	66.6
" Ginger.....	66.0
" Allspice.....	70.4
" Cinnamon	81.8
" Cassia.....	57.1
" Cloves.....	76.2
" Pepper, black.....	70.0
" " white.....	71.4
" " red.....	50.0
" Mace.....	50.0
" Nutmeg.....	40.0

The adulterating materials, however, all belong to the class claimed to be harmless, and in no instance has any poisonous substance been determined.

In Group VII there were examined, of *coffees*, 35 samples of unroasted; three samples of roasted unground; 21 samples of ground coffee and three samples of coffee-extract.

Among the 35 samples of unroasted coffee, there were found in five packages a few grains which had been slightly colored or faced, a minute quantity of blue pigment, apparently Prussian blue, adhering to the more prominent part of the bean, but the quantity was not sufficient to permit of satisfactory chemical tests. The roasted, unground coffee was found to be pure; of the 21 samples of ground coffee, however, 19 contained foreign substances, chiefly chicory and beans, and occasionally wheat or other grain coarsely ground. One sample consisted wholly of roasted hominy.

Teas.—Forty-three samples of green tea and 18 of black tea were submitted for examination.

Many of these were of most inferior quality, but no adulteration either vegetable or mineral was detected. Even the admixture of exhausted leaves cannot be positively asserted.

Chocolate and chicory. Five samples of the former and three of the latter were examined. Adulteration can, however, only be shown in one sample of chicory which was found to contain caramel.

In addition to the samples of food articles already mentioned, a considerable number of the so-called spice mixtures were examined.

These productions, bearing the marks of "P. D." pepper, "P. D." ginger, "P. D." cloves and so on, through the whole aromatic list; being nothing but imitations, with only so much flavoring of the genuine article as will make the goods sell, must be stamped as a fraud.

GROUP VI.

Including sugars, syrups, molasses, glucose, confectionery, honey and soda-water syrups, was assigned to W. H. Pitt. The report is chiefly devoted to the discussion of the manufacture of glucose and its properties. It is shown that glucose is a pure and wholesome article of food, being carefully manufactured and entirely free from objectionable impurities or admixtures.

Fifteen samples of commercial sugar were examined, but no adulterations were detected.

Of three samples of maple syrup examined, two were pure, one contained 35 per cent of artificial glucose.

Of three samples of honey, two were pure, one contained 50 per cent of artificial glucose.

In confectionery, glucose, terra alba and yellow chromate of lead were detected.

Albert L. Colby, Ph. B., was intrusted to prepare a supplementary report on sugar.

It is shown that the sugars now in the market are much cleaner and freer from the long list of impurities and adulterations reported to exist in former times, but that the falsification now practiced is the addition of glucose (grape-sugar) to the refined cane sugar.

116 samples of the various kinds of refined cane sugars sold in New York were examined. Of these 34 were classed as microscopically clean, 54 were very slightly contaminated with dust, 22 contained con-

siderable dirt, and 6 were very dirty. But in no case was there any intentional addition of insoluble mineral matter. Of these 33 were powdered sugar, all of which were found to be unadulterated.

The 49 samples of white sugars were all found to be free from adulteration with glucose. But of the 67 brown sugars examined, 4 were adulterated, and these to a large extent (from 22 to 33 per cent).

These adulterated sugars are sold in the wholesale market under certain trade names which signify to the purchaser their character. These are however usually disposed of in the retail trade as pure sugars.

As most of these "mixed sugars" are sent to the country they are rarely to be found in the hands of retail city grocers.

The methods of analysis are also given including a description of the apparatus used in determining the percentage of glucose added as an adulterant.

Appended to the report is a classified list of references to the literature of sugar.

: GROUP VIII.

Dr. F. Engelhardt undertook Group VIII: Wines, beers, spirits and cordials. After discussing the most approved methods for the determination of the specific gravity, alcohol, extract, sugar, acids, ash, glycerine, etc. and after treating of the adulterants and methods of adulteration of liquors, Dr. Engelhardt details the results of chemical analyses.

Of 25 samples of brandy examined, 16 gave a distinct reaction for fusel oil, six contained only traces and three none whatever. In none could either sulphuric acid or chlorides be detected.

25 samples of whiskey were examined, and it appears evident that the addition of water and coloring matter is practiced more than any other adulteration. No free sulphuric acid was found in any of the samples. The alcohol varied from 28.9 to 60.3 per cent by volume.

25 samples of rum were examined, the percentage of alcohol by volume varied from 26.4 to 57.8. No objectionable additions were detected.

GROUPS IX AND X.

Frederich Hoffman, Ph. D. was entrusted with Group X, pharmaceutical chemicals and their preparations, and Group XI, crude vegetable and animal drugs.

In testing medicinal chemicals, recourse was had to the most approved methods. In all, 317 samples were tested, only 11 of which were found to be either adulterated or deficient in quality.

In examining crude and powdered drugs, Dr. Hoffman relied upon their physical characteristics and their structure, and in some cases resorted to chemical tests.

Of the crude vegetable drugs, 232 samples were subjected to examination. Of these, 85 were either adulterated or did not in quality come up to the required standard.

Of powdered drugs, which offer in their examination much greater difficulties, 110 specimens were tested, embracing ipecac, jalap, orris and rhubarb roots and mustard seed, and of these, 46 were not of the required purity and strength.

In consideration of the fact that there are in the State of New York approximately, 2,800 drug stores where drugs and ready-made medicines are also sold, the number of specimens obtained for this examination presents too insignificant a figure upon which to form a correct inference or an average estimate of the quality and general character of drugs and medicines dispensed at present through our State.

From the tests however, made, medical chemicals are to be considered of "fair quality," less so in case of crude drugs. Powdered drugs "are to a great extent of unsatisfactory quality and questionable reliability."

GROUP XII.

To Prof. Willis G. Tucker, Ph. D., was assigned Group XII.

The granular effervescent-salts, fluid citrate of magnesia, seidlitz powders.

Seidlitz powders and citrate of magnesia being the most important official preparations of this class, they claimed Dr. Tucker's special attention.

Seidlitz powders are produced by the mixing of two separate powders; the one 35 grains of tartaric acid, the other an intimate mixture of 40 grains of bicarbonate of sodium and 120 grains of the double tartaric of sodium and potassium or "Rochelle salt."

Seventy-two powders were examined, all of which were tested as to their weight, and it was found that there was considerable deviation from the prescribed standard.

A qualitative examination was then made of each powder. In every instance the tartaric acid was shown to be of good or fair quality, and the "seidlitz mixture," was only in three cases, found to be other than a mixture of Rochelle salts and soda, in one instance sugar was added, the second contained a considerable quantity of bicarbonate of soda, and in the third the soda was entirely wanting.

The quantitative determination of the bicarbonate of soda showed that there is considerable variation, evidently intentional, in the proportions of the ingredients employed.

The summary of the investigation leads to the conclusion that gross adulteration of this article is probably uncommon, but that without doubt, the powders are frequently, intentionally, manufactured of short weight, whereby the efficacy of these powders is materially lessened or even annulled.

The examination of fourteen samples of citrate of magnesium solution, showed six to be spurious, from which it would appear that the preparation sold under the name of "solution of citrate of magnesium" is often sophisticated.

PERMISSIBLE ADMIXTURES.

Paragraph 7 of section 3, and section 4, makes provision for certain harmless admixtures of food and drugs. The language is as follows:

Paragraph 7 of § 3. "Provided that the State Board of Health may with the approval of the governor, from time to time, declare certain articles or preparations to be exempt from the provisions of this act. And provided further, that the provisions of this act shall

not apply to mixtures or compounds recognized as ordinary articles of food, provided that the same are not injurious to health and that the articles are distinctly labeled as a mixture, stating the components of the mixture."

§ 4. It shall be the duty of the State Board of Health to prepare and publish, from time to time, lists of the articles, mixtures or compounds declared to be exempt from the provisions of this act in accordance with the preceding section. The State Board of Health shall also, from time to time, fix the limits of variability permissible in any article of food or drug, or compound, the standard of which is not established by any national pharmacopœia."

Numerous applications have been made to the Board by manufacturers and tradesmen, requesting the exact interpretation of these paragraphs, and also submitting various preparations for consideration, such for instance as coffee mixed with chicory, dried peas, etc.; syrup made chiefly of glucose from corn; mustard diluted with wheat or rice flour, etc., etc.

It has been deemed best not to take decisive action on any of these questions till after the reports on the different groups shall have been printed and carefully considered.

LITERATURE.

In addition to the special literature relating to each topic of investigation which is mentioned in each of the reports, the committee appends to its report a general list of works relating to the analyses of food and drugs prepared by Albert L. Colby, Ph. B.

Respectfully submitted,

C. F. CHANDLER,

Chairman of the Sanitary Committee.

GROUP I.*

MILK FRESH AND CONDENSED.

By C. F. CHANDLER, Ph. D., and C. E. MUNSELL, Ph. B.

GROUP II.

BUTTER — DAIRY AND ARTIFICIAL; CHEESE; LARD; OLIVE OIL, AND FRUIT ESSENCES.

By G. C. CALDWELL, Ph. D.

To Dr. C. F. CHANDLER,

Chairman of the Sanitary Committee:

SIR. — I submit herewith my report on the adulteration of articles of food and of drugs assigned to me:

In accordance with the request made at the first meeting of the bureau, I have collected and arranged so much of the literature of each subject as was accessible to me. I think that this collection is fairly complete so far as regards the journals; some recent German and many older monograph works on the adulteration of food I have been unable to consult; but having so full an account of the journalistic

*This report is printed after the reports on the other groups.

literature, I trust that I should not have found much additional matter of any importance in these works.

After this account of the literature of each subject of my division, I have given the results of my own work, and then, to avoid frequent repetitions of titles of articles and works, referred to, these are given together in the alphabetical order of the names of the authors; references to this list are made by small figures after each author's name.

Very truly yours,

G. C. CALDWELL, PH. D.

BUTTER.

Literature — According to the several authorities who have written on the subject, the substances named in the following list have been or are added to butter for fraudulent purposes: alum, borax, barium sulphate or heavy spar, chalk, curd, fats cheaper than butter, flour, gypsum, lard, lead carbonate, lead chromate (yellow), potato flour, salt, sodium silicate or soluble glass, soapstone, starch, and water in excessive quantity. From carelessness in respect to the vessels in which it is put, it may contain copper or zinc; or (The Analyst II, 36) copper may be introduced by the practice, said to be not uncommon in England, of throwing some copper coins into the churn to make the butter come when it obstinately refuses to come in the usual manner.

Except as regards the cheaper fats, and water in excessive quantity, there is very little precise and reliable information as to the extent to which these various adulterations occur. I have met with only general statements by French, German and English writers, such as that they are common, or occasional, or as in the case of two or three, such as lead chromate for coloring the butter, rare. I shall limit my report on the adulteration of butter to the consideration of the use of cheaper fats and of water, partly because of the vastly greater importance, which at present attaches to the use of the former as compared with any other alleged adulterant, and partly because there was not sufficient time at my command to enter into an examination for other adulterants whose use is probably very rare in this country.

Cheaper fats as adulterants of butter — oleomargarine. — As far back as 1861, English chemists state that the adulteration of butter with cheaper fats is practiced in England on a large scale. *Hoskins* (67), writing at about that time says, that lard is the most common adulterant of butter in this country, and in one case that came under his own observation flour was added with the lard.

At present, oleomargarine occupies the most prominent position as an adulterant of butter. As is well known, this substance consists simply of the more fusible portion of the fat of beef animals; the fat is washed, cut up and melted at from 122° to 124° Fahr., the liquid fat is drawn off from the matters that settle to the bottom or collect on the surface, strained and kept at from 80° to 90° till the stearine and palmitine crystallize out to a large extent; these glycerides are separated from the still liquid portion by hydraulic pressure in a room kept at the same temperature; this liquid portion, which solidifies as it cools, constitutes the oleomargarine. To make it into butter it is churned with milk (80 pounds of milk to 500 of oil) and a little annatto, and run from the churn into a trough where it is suddenly chilled by thoroughly

mixing it with pounded ice, and is thereby prevented from crystallizing; it is then salted and worked. *V. Lang* (83) mentions the use of the extract of the milk glands of the cow to aid in emulsionizing the oil with the water of the milk, as still an essential feature in European practice in the manufacture of this butter, 110 pounds of the oil, 18 to 22 quarts of fresh milk and the same quantity of the extract being churned together. He mentions also the use of cumarin which is one of the substances that give the agreeable aroma to many grasses, and which is most abundant in the Tonka bean, for giving to this artificial butter that aroma which natural butter appears to derive from the food of cows, a very small quantity of the alcoholic solution of the substance or of the alcoholic extract of the bean itself being sufficient to flavor a large quantity of butter.

Concerning the statistics of the manufacture of oleomargarine and artificial butter.—In this State three firms are engaged in this manufacture, viz.: the Commercial Manufacturing Company, which has a factory in New York city and another in Albany; Schwarzschild & Sultzberger, with one factory in New York city and Stern & Metzger who have one factory in New York and another in Buffalo. The oil and butter are also manufactured in western cities. It was stated before the *New York Assembly Committee on Public Health* (43) that there are fifteen establishments in the United States engaged in this manufacture.

The Commercial Manufacturing Company produced from June, 1880 to May 1881, 5,189,297 lbs. of oleomargarine and 3,999,527 lbs. of oleomargarine butter, at their Albany branch they made 20,000 lbs. of oleomargarine per week. Schwarzschild & Sultzberger make from 230,000 to 250,000 lbs. of oleomargarine per week from the fat of their adjacent slaughter-houses, and at Buffalo 30,000 to 40,000 lbs a week. Stern & Metzger produce 150,000 lbs. per week.

These figures were obtained by Inspector Munsell from the firms themselves.

The oleomargarine is sold at about 16 cents a pound.

Concerning the *disposition of this oleomargarine*, it is both exported and sold in this country. From the testimony before the above mentioned committee (43) it appears that large quantities are sold for use in New York city and shipped to various parts of the State and to New England; it was stated that farmers buy it to mix with their butter.

Abroad, according to *Lang* (83), it is highly esteemed for use on ship-board as a substitute for butter in cooking, since it keeps so well and is at the same time quite neutral in taste.

Concerning the *quality of the materials used in its manufacture* statements conflict. It is naturally claimed by the manufacturers that only the best part of the beef fat is used, and that a reasonable degree of cleanliness is maintained in all parts of the factory; others, in some cases undoubtedly quite as strongly biased in the opposite direction, say that all the refuse fat of the animal is used, clean and unclean alike, and even the fat of animals, including horses, that have died of disease; that alum and acids are used in the manufacture for cleansing the fat, and that the factories are filthy. No one can deny that in a manufacture of this kind there are such disagreeable possibilities, but many impartial observers who have visited the factories of

established reputation do not find such statements, as to uncleanness of the materials used or of the process of manufacture, to be justified, at least so far as factories of such a character are concerned.

Oleomargarine butter.—This oleomargarine is made into butter on a large scale by the Commercial Manufacturing Company and the oil is used by many firms in the city engaged in the cheese and butter business for making this artificial butter (Munsell) or perhaps for mixing with genuine butter. In the minority report of the *New York Assembly Committee on Public Health*, it is stated that the total product of oleomargarine butter in the State is 20,000,000 lbs. per annum, which is equal to one-fifth of the quantity of dairy butter made. Concerning the disposition of this artificial butter, it is exported and sold at home. The domestic trade, according to H. K. Thurber's testimony before this committee (43), has lately made up a much larger proportion of the whole than formerly; of the product of the Commercial Manufacturing Company in 1880-1 not over 10 per cent was exported, in the place of 40 or 50 per cent as formerly. The butter is consumed in New York city, New Jersey, Pennsylvania and in New England manufacturing towns, and much of it goes to the Southern States where it is stated to be sold under its own name. One witness before the Assembly Committee (43) affirmed that more artificial than natural butter is consumed in New York city.

It is sold at the same price as ordinary grades of butter; it was stated by many of the witnesses before the *New York Assembly committee* (43), that though it could well be afforded at a lower rate, to sell it so would only arouse suspicion and really injure the trade. It was also affirmed that it is sold in such a way as to imply that it is genuine butter, even if not stated to be such in so many words, and the consumer takes it supposing it to be such. But it appears that there are, or at least have been, places in the city where it is sold under its own name. It was stated that it is purchased largely by restaurants, boarding-house and hotel keepers.

As an imitation of genuine butter it is generally acknowledged to be so good that most people would not detect it, and that even experts may occasionally be deceived. It is more crumbly than genuine butter in cold weather, and to avoid this defect genuine butter is mixed with it—or, as in Holland, vegetable oils. Adulteration of genuine butter with from 40 to 60 per cent of oleomargarine is even more difficult of detection by the ordinary public than the entire substitution of oleomargarine butter for the genuine article; some even affirm that it cannot in some cases be distinguished from fancy or the so-called gilt-edged butter.

Lard as an adulterant of butter. It was affirmed by many witnesses before the *Assembly committee* (43), that lard is used in western cities for the adulteration of butter, and the product, containing only 25 to 50 per cent of genuine butter, is shipped to the east as well as consumed at home; that the process is kept secret, but that the trade here in the product under the name of "Lardine" is open and notorious; that thousands and thousands of packages of it reach the city, and that large quantities are shipped to Europe; that it is sold to retail dealers as oleomargarine butter, and by them to consumers as genuine butter; that fine soapstone powder is sometimes mixed with the lard; that the imitation is so good as to deceive anybody, and it is a

more dangerous counterfeit than oleomargarine butter, while other witnesses considered it as less so; that bakers prefer it to oleomargarine butter because softer. Inspector Munsell discovered one of these factories in New York city in the upper stories of a pork-packing establishment; there the lumps of the perfectly fresh hog fat are broken up, the tissue removed as far as possible, and the residue is melted by steam with about equal parts of inferior butter; 5,000 lbs. of larded butter are made per week at this establishment. A sample of the butter was examined by me for volatile fatty acids, and with the microscope (No. 2017, p. 527). One witness before the committee above cited, gave it as his opinion that all the firms manufacturing oleomargarine use some lard. It was stated in April, 1880, that lard butter was sold in New York at twenty cents a pound; that in character it was ranked as "fair, about on a par with ordinary dairy lines, but grain too fine, and no quality."

Mr. Burrill (of Whitman & Burrill, Little Falls), states in a letter to Mr. Munsell, that by way of experiment only, they have made a few pounds of butter from their emulsion of lard (see p.), or artificial cream as they choose to call it, by setting it aside for twenty-four hours to become acid, as cream usually is for churning, and then churning it in the usual manner, and also by "setting" a mixture of the artificial cream and new milk for the cream to rise in the usual manner; both the natural and artificial cream came up together, and this mixture when churned gave a product which it was very difficult to distinguish from the best creamery products, although only one-fourth to one-half of it was genuine butter. He states, however, that the artificial cream is not used in this way at any of the creameries where it is made, but that all of it goes into the cheese; only genuine butter is made at the lard cheese factories.

Concerning *adulteration of butter with vegetable oils*, it was affirmed in the minority report of the Assembly committee that the adulteration of butter with lard and *cotton-seed oil* was known to be extensive. In Holland, according to *Griessmayer* (52), an imitation of butter is made by simply mixing tallow and olive oil. It is affirmed that in Holland rape oil is purified by heating it with starch to 300° C. and above, till a golden yellow, agreeably tasting oil is obtained, which mixed with tallow gives a butter-like product; but *Lang* (83), says that in repeated attempts to make this oil, he always gets a product that is very offensive both in odor and taste, which could not possibly be used for making an imitation of butter.

THE QUESTION OF ADULTERATION.

Is the use of these cheaper fats for butter an *adulteration*, since butter is mostly nothing but fats of identically the same character?

In substituting a cheaper article for a dearer one, and selling it for the dearer one, the law is violated. Whether it is also violated by the addition of an unwholesome substance to a common and necessary article of food appears to be still an open question. Leaving for the moment the affirmations out of consideration, that have been made as to the presence of unwholesome matters in the oleomargarine itself, is pure oleomargarine unwholesome or not? In 1879 the *English Local Government Board*, which has charge of the detection and ex-

posure of adulterations of food, declared (*Mark Lane Express*, August 25, 1879), that it could see no reason against the use of oleomargarine, provided that it be invariably sold under a distinctive name, and not fraudulently substituted for genuine butter. According to earlier French official reports, artificial butter was recognized as a perfectly wholesome article of food (*Encyclopædia Britannica*, Article, *Butter*). But later, in a *Report of a Commission* appointed by the French Academy of Medicine, the opinion is expressed that its effect on the health is not good, because of its larger proportion of glycerides of the insoluble fatty acids, and the greater difficulty with which it is emulsioned in the digestive organs (*Wagner's Jahresbericht*, 1881, p. 711; *Country Gentlemen*, 1880, pp. 392, 449). But no positive evidence of the soundness of the opinion appears to be given.*

But if certain assertions which have been made public, mostly in the newspapers, as to the character of the oleomargarine itself shall meet with any wide confirmation, the use of oleomargarine in or for butter is dangerous to health because of the impurities that it contains. *Mr. John Michell* (94) has found portions of tissue and muscle, and cells and forms of a suspicious character in oleomargarine. *Mr. Thomas Taylor* (127), microscopist of the Département of Agriculture at Washington, with a power of 250 diameters observed in a sample of oleomargarine animal tissue more or less over the whole field, and in another instance crystals of magnesium urate, showing the fat used to have been impure, but in a communication to *H. A. Mott* (96) he appears to take a different view of the matter, and to regard oleomargarine butter as harmless. *Dr. R. U. Piper* (108) states that he found in a sample of oleomargarine butter, received from a respectable eating house in Chicago, shreds of animal tissue, spores, forms frequently seen in foul water, other forms moving actively across the field, and various forms of fungi such as may be seen in putrifying milk; he also states in another western paper (107) that he has seen eggs resembling those of tape worms. It is often affirmed that the fat of diseased animals is used for the preparation of oleomargarine, and, as having an important bearing in respect to this assertion, *Rev. W. H. Dallinger* (94) is quoted as stating that the whole "septic series of organisms require a temperature of 140° Fahr. to kill the fully developed forms," and the "germs of this series require at least 212° to 235° Fahr. for their destruction in a fluid," and that "the temperature reached in the manufacture of oleomargarine is perfectly innocuous to such organisms of this kind as refuse fats may contain," and that "the eggs of nematoda are practically uninjured by a temperature of 120° Fahr."

As an offset to these affirmations we have the statements of other microscopists, such as *Prof. J. W. S. Arnold* (6) of the University of New York, that no such objects are found in good oleomargarine, and the often repeated assertion that only clean fat of healthy animals is used for its manufacture. *H. A. Mott* (96) shows what precautions are taken in this respect, and brings together in his pamphlet facts and opinions in reply to those who see so much danger to the public health lurking in this substance. But it will require much negative testimony, based on the results of careful and perfectly impartial observa-

* See p. 531 for some considerations on the wholesomeness of lard.

tion, to satisfactorily rebut in the judgment of the people such positive testimony as we have noticed; this statement may be made and accepted without expressing any opinion, one way or the other, on the reliability of this positive testimony as to what has actually been seen with the aid of the microscope, by persons claiming to be acquainted with the use of that instrument. The results of my own examination of such samples of butter as have been sent to me by the inspectors, and have been found by chemical tests to be oleomargarine butter, may furnish some contribution to the solution of the question as to the occurrence of these objects.

Water as an adulterant.—Without fraudulent intent butter may contain as much as 20 per cent of water, although it does not ordinarily, when of fair quality, contain more than half as much. *Hassall, Parkes, Calvert, and Angell and Hehner* (5) give from 5 to 10 per cent as the ordinary limits. *Wanklyn* (5) found in 50 samples of London Workhouse butter 8.6 to 23.7 per cent. *Fleischmann* (46) says that, according to all statements which he can find in the literature of the subject, pure, unadulterated butter never contains over 18 per cent of water, nor less than 80 per cent of fat, and from 2 to 6 per cent of other matters; and that on the average it contains when salted, 12 per cent of water, 83.5 per cent of fat, and 4.5 per cent of salt and other matter. Nevertheless, he says, butter can be loaded with from 20 to 50 per cent of water by kneading it in, or by kneading fresh butter with salt water, or by stirring the butter vigorously with boiling water till the water cools down; its appearance when so charged with water may not be essentially changed, and its taste may be fair. *Hassall* (56) says that water is one of the most frequent adulterations of inferior butters, salt being added at the same time so that more water will be taken up; that 50 per cent of water may be incorporated into the butter by melting it and stirring it with salt and water. *Angell and Hehner* (5) found 42.3 per cent in one instance. *Lang* (83) shows that oleomargarine butter usually contains less water than natural butter, and more fat, which he considers as an item in its favor. *Johanson* (71) gives instances where butter contained from 40 to 49 per cent of water, incorporated by adding luke-warm water to the melted butter and then stirring the whole together in a pail surrounded with snow till the mass became solid; he states that great care has to be taken however, to keep such butter cold till it is sold, for in a warm room the water separates out and the butter floats in it. In one case in England (*The Analyst*, 4, 16), the seller of a sample of butter containing 23 per cent of water was convicted of fraud. It will be seen from the results of my examination of butters, that this method of adulteration is not unknown in this country.

METHODS OF EXAMINATION OF BUTTER.

Most of the recent literature on the examination of butter for the detection of adulteration refers to the detection of oleomargarine or other fats. For convenience of reference I have classified the methods of examination as follows:

- A. Tests by specific gravity.
- B. Tests by melting point.
- C. Tests by the microscope.

D. Brief qualitative tests.

E. Partial quantitative analysis.

A. *The specific gravity test.* This is applied to the pure butter fat, freed from water, casein and salts by filtering it while melted. The usefulness of the test depends on the fact that fats generally used for the adulteration of butter have a lower specific gravity than that of pure butter fat; while the specific gravity of the latter ranges from 0.865 to 0.868 at 100° C., beef and mutton fat have a specific gravity of 0.860, and lard 0.861. Some analysts take the specific gravity of the butter at temperature below its melting point, and others above, treating it as a liquid, others at a little below 100° C. and others at 100° C. or the boiling point of water.

Stillwell (125) gives the specific gravity of several fats. *Blythe* (15) gives a method for determining the specific gravity of butter as a solid. *Pfeifer* (106) describes a very convenient method for taking the specific gravity at 100° C. with a Mohr-Westphal balance. *Estcourt* (41) gives a method for taking the specific gravity at 98° C., which is the constant temperature taken by paraffine in a cylinder surrounded by boiling water. *Bell* (12) describes his method of determining the specific gravity by the pycnometer, and gives results of the determinations of the specific gravity of 117 samples of genuine butter, together with their fusing points and proximate composition. *E. Koenig* (76) gives a method for the use of the areometer at 100° C. *Ambuhl* (2) modifies Koenig's process slightly. *A. Mayer* (90) also uses an areometer at 100°, gives a new form of apparatus for the more accurate reading of the instrument, and thinks the test is very reliable. *Leune and Harbulot* (86) describe a margarimeter in which an areometer is used at 100°. *Jones* (72) affirms that if butter fat is kept for a considerable time at 100° or even at 50° C. its specific gravity increases sensibly. *Hager* (53) gets the fat into rounded globules by pouring it, while melted, dropwise into cold alcohol, and then takes the specific gravity of a dilute alcohol or glycerine, in which these globules will remain stationary. *Wigner* (135) uses a glass bulb which will just sink in pure butter fat at a certain temperature; if this bulb sinks in a sample of butter at a lower temperature the sample is to be regarded as suspicious. Several analysts (*The Analyst*, 1, 1877, p. 26), agree that the specific gravity test by any method has comparatively little value.

The specific gravity test is not mentioned at all in many recent monograph works. *Dietzsch, Husson, Hassall, Liebermann and Melicis* do not allude to it. *Blythe* (14) describes his own and *Wigner's* methods. *Griessmayer* (52) and *Elsner* (39) describe only Koenig's method, and the latter praises it highly.

It may be concluded that the test is not one upon which much reliance can be placed.

B. *The fusing point test.* This test depends for its usefulness on the fact that the melting point of butter is lower than that of many other fats with which it is commonly adulterated; it must, like the specific gravity test, be applied to the pure fats of the butter, freed by melting and hot filtration from other matters.

The fusing point of genuine butter fat ranges, according to various authorities, from 28° to 37° C.

Wimmel (136) gives the melting and solidifying and sinking weight points of several fats. He mentions as having a lower melting point than butter, a substance used for its adulteration, known as Mangosteen oil, Kokum butter or butterine, obtained from the seeds of *Garcinia Indica*, which melts at 31.3°C . while he gives the fusing point of butter fat as 35.8° . *Dietzsch* (29) gives the fusing point of genuine butter at 36° and its solidifying point at 23° deg., and of French oleomargarine at 27° and 25° but mentions no method of determination. *Elsner* (39) gives 31.5° for the fusing point, and 20° for the solidifying point of butter, and for artificial butter 28° and 20° for these two points, but gives no method of determination. *Fleischmann* (46) gives 36°C . for the fusing point and 23° for the solidifying point of pure butter, but he places little reliance on this test for adulteration with other fats, since it would be so easy to make mixtures of cheaper fats having the same melting point. *Griessmayer* does not mention the test. *Hassall* (56) describes a method of making the test which consists in noting the temperature at which a small bulb, lighter than the fat and temporarily anchored at the bottom of the tube, rises when released by the melting of the fat above it; by this contrivance he gets the melting point of butter fat to be from 32.8° to 34.9° , and of all other natural animal fats from 38° to 51° . *Husson* (68) gives 28° for the melting point of butter, and discusses the unsatisfactory character of the test, quoting "Chevallier and Baudrimont's Dictionnaire des Falsifications," and other authorities to that effect. Butter fat according to him melts at 31° to 32.5° . He also discusses the methods of determining the melting points of fats. *Ruedorff* (118) discusses the same subject and criticises *Wimmel*. *Moser* (95) finds the fusing points of two samples of artificial butter to be below, instead of above that of genuine butter, namely 27° and 31.7° . *Wuenzel* (139) gives the melting points of pure butter and of adulterated mixtures with other fats. *Bell* (12) finds in the case of 117 samples of genuine butter that the melting point ranges from 29.5° to 35°C . *Roster* (115) describes a method for the determination of the melting point of organic bodies. A writer in *Les Mondes* (*Chem. News*, 43, 1880, p. 77), states that by adding lard to oleomargarine its melting point can be lowered, so that this test will not betray adulteration of butter with such a mixture. *Duffy* (35) describes allotropic modifications of fats with different melting points, and (34) shows the difficulties to be met with in the testing of butter by the melting point. *Tripe* (130) and also *Heisch* (63) describe methods for the determination of the fusing point by the use of a capillary tube to take up the fat, and *Kellner* (75) modifies their method. *Angell* (4) determines the melting point by noting the temperature at which a weight, consisting of a small pear shaped glass bulb, occupying about one cubic centimetre in volume and weighing with some mercury contained in it very nearly 3.4 grams, sinks into the fat when the temperature is slowly raised. In the case of 24 samples of genuine butter examined, this point ranged from 34.3° to 36.6°C . If foreign fats are present the sinking point varies with the proportion of the adulterant present. *Redwood* (110) notes the temperature at which a globule of the fat on mercury fuses and spreads over the surface of the metal in which the bulb of the thermometer is immersed. *Brown* (18) gives the behavior with heat of several genuine butters, other fats and mixtures of butter with them.

In monograph works, *Blythe* (14) describes the use of the capillary tube. He shows what appears plainly enough from the figures given above, that authorities do not agree as to what the fusing point is, and as to the effect of admixture of other fats. *Liebermann* and *Medicus* make no mention of the test.

It is clear that each one who would test butter for adulteration by the determination of the fusing point should fix upon his own standard of comparison by many tests of his own of genuine butter and its adulterants and of mixtures of them together.

C. Microscopic tests.—These may be applied for the detection of starch or flour and of foreign fats; in the latter case the test sometimes depends upon the fact that as these fats have, at least in some cases, been melted in the process of their manufacture, their solid particles may be supposed to show a crystalline structure under the microscope, which can be brought out more plainly with the aid of a polarizer.

Horsley (65) distinguished butter and tallow from lard by the appearance under the microscope of the residues left by the spontaneous evaporation of a benzol (petroleum ether?) solution of the fat, after moistening the residues with ammonia. *Lechartier* (84) describes the test, but the editor of the journal states by way of comment, that in one case butter a year old and guaranteed to be genuine was seen by him to contain crystals. *Mylius* (100) describes the appearance in polarized light of fats that have been melted, but *Frissenius* (49) calls to mind Hassall's statement that crystals may appear in genuine butter that has been kept for a long time, and that they are often met with even in cream. *J. C. Brown* (18) gives the results of an examination of butter and several other fats under the microscope with polarized light. The *English public analysts* (40) discuss the test, and conclude that little can be accomplished with it. *T. Taylor* (128) used the microscope and polarized light for distinguishing natural from artificial butter. *Storch* (126) shows that natural butter is composed of fat globules and droplets of butter serum, and that with a magnifying power of 300 to 400 diameters genuine butter presents the appearance of a crowded mass of these droplets and globules, while where foreign fats are kneaded in continuous plates of fat are to be seen here and there displacing the droplets and globules, and that oleo-margarine butter contains but a few and unusually large droplets of serum; these observations are illustrated by figures in the original article.

In monograph works, *Blythe* (14) recommends the use of the microscope with the polarizer. *Dietzsch* (29) does not mention the test, and *Elsner* (39) describes it only for starchy substances. *Griessmayer* (52) quotes *Mylius*. *Husson* (69) describes the test with polarized light, but shows that the crystalline appearance may be presented where the butter had previously been melted on the outside in very warm weather, or when, as is sometimes done in Devonshire, the cream is scalded, or boiling water is poured into the churn before the cream is put in. Scalded cream butter has been made also in this country, but is now rarely made, as we are informed. *Liebermann* (86) does not mention the microscopic test, and *Medicus* (91) speaks of it only as applied to the detection of starchy adulterations. *Angell and Hohner* (5) say that the occurrence of crystals in butter is ground for suspicion.

but not evidence of adulteration, nor is their absence evidence of freedom from adulteration. *Mott* (93) shows that by the rapid chilling of the churned oleomargarine it is prevented from crystallizing, so that the regular oleomargarine butter, as made in this country, shows under the microscope fat globules like ordinary butter. *Taylor* (96) seems to grant this.

It is plain therefore that little dependence can be placed on any microscopic test of the genuineness of butter, at least so far as the observation of crystalline forms of foreign fats is concerned, for neither does the absence of such forms prove that the butter does not contain oleomargarine, nor does their presence prove the adulteration.

Brief-qualitative tests for adulteration with foreign fats. — Under this head I include such tests, simple in respect to their manipulation and in respect to the apparatus required, as can be made under ordinary circumstances, and with inexpensive means and appliances. *Horsley* (66) and *Ballard* (9), treat the filtered fat with ether at 185° C., when butter fat dissolves readily, while lard, tallow and the like do not dissolve so easily; and by the addition of methylic alcohol to the solution butter fat is not precipitated, while the others are. *Hoorn* (64) takes up the fat of the butter with petroleum ether of sp. gr., 0.69, and boiling point 80° to 110°, evaporates the solution completely, dissolves one gram of the residue in seven cc. of ether, corks the flask and lets it stand an hour in water at 10 to 15° C.; normal butter fat remains in solution, while veal fat, tallow and lard are deposited if present in larger proportions than ten per cent. *J. C. Brown* (18) describes the behavior of several fats with ether, and gives a method for detecting foreign fats by the larger deposit from an ethereal solution under certain conditions, of stearine from fats containing more of it than butter contains. *Angell and Hehner* (5) pronounce the method to be far from satisfactory.

Galehouse (50) gives a method based on the insolubility of potassium stearate in water when produced at from 205° to 216° C. The carefully washed fat is saponified by heating it to that temperature with solid potassium hydrate; on boiling the cooled soap with successive portions of distilled water till 200 cc. have been used, an opalescent liquid is obtained with genuine butter fat, but a decidedly opaque one if lard or any other fat containing much stearine has been added.

Lechartier (84) states that when genuine butter is heated to fusion it passes at once to a clear yellow oil, while artificial butter liquefies gradually, forming at first a whitish emulsion. *Hager* (53) sets the oil on fire in a lampwick, after a few moments extinguishes the flame, and notes the odor of the smoke from the glowing wick; in the case of oleomargarine butter there is a very decided reminder of a smoking tallow candle wick. *Donny* (31) heats the butter in a test tube to 150° or 160° C. Artificial butter foams but little, and the ebullition is violent and irregular, with sudden spurts of effervescence; the particles of casein become brown and attach themselves in clots to the sides of the tube; genuine butter gives with similar treatment much less foam and less violent action, and the brown particles remain suspended in the liquid, giving a brown color to the whole, as in making a butter sauce. *De Smedt* dissolves the butter fat in ether, pours the solution off from the insoluble matters into a saucer and leaves it till the ether has evaporated; the residue from artificial butter has more or less of

a tallowy odor, especially if gently heated, which the residue from genuine butter does not emit; the odor of its residue is more like that of butter itself. *Hager* (53) distils a mixture of the filtered melted fat of the butter with two parts of a mixture of sulphuric acid and alcohol, and observes the odor of butyric ether of the distillate which in the case of genuine butter is of course very marked.

Crook (27) treats the filtered fat with a solution of carbolic acid; butter gives a clear solution, while beef, mutton or swine fat gives two layers, the upper one of which becomes turbid on cooling. *Filsinger* (44) mixes five grams of the melted butter fat with 15 cc. of ether, sp. gr., 0.725, and another like quantity with 15 cc. of a mixture of four parts ether and one part of alcohol by volume, and keeps these mixtures at 18° to 19° C. for 12 hours. Pure butter fat solution remains all this time perfectly clear, while if other fats are present the liquids become turbid; the author thinks that ten per cent of adulterations with foreign fats can be detected in this way.

In recent monograph works, *Blythe* (14) mentions no test coming under this head not already given above. *Dietzsch* (29) describes the following: he mixes three volumes of concentrated sulphuric acid with two volumes of the clear butter fat obtained by filtration, or by allowing the butter to stand for a considerable time in the melted condition when all the matters not fat will settle to the bottom or collect in a crust on the surface, and then pouring off the clear fat; when thus treated with acid genuine butter fat does not become much heated, while it changes to yellowish red and then to a uniform brown, translucent mass; if tallow or any other animal fat is present the mixture becomes very hot and black, and opaque; a writer in *The Analyst*, who finds this test described in the *Pharmaceutische Centralhalle* is disposed to ridicule it. *Dietzsch* mentions the solubility test in a mixture of ether and alcohol, the butyric ether test, and that of the smoking wick immersed in the fat, but he limits the applicability of the butyric ether test to artificial butter made from rape-seed oil and tallow, or lard and tallow. He also states that if a piece of blue litmus paper is laid on genuine butter and the whole is exposed under a bell jar to the sun for several hours, the paper will turn red, while such artificial butter as that just mentioned will not give any change of color. *Elsner* (39), mentions no test that would come under this head. *Griessmayer* (52), describes the color test with sulphuric acid for rape-seed oil, lard and tallow, and applies the butyric ether test to the cooled residue of this test; he also describes the smoking-wick test for tallow, and the solubility test in ether and alcohol for lard and beef or mutton tallow, adding that if the butter contains less than ten per cent of these substances the test-glass must be put in cold water; the carbolic acid test is also described.

Husson (68) describes in detail two tests of his own. By the test of solubility in castor oil he distinguishes between butter, lard, oleomargarine and suet, the last two mentioned requiring the highest temperatures 50° to 70° C. for their solution. The behavior of these several substances on cooling is also different, excepting in the case of butter and oleomargarine; on treating these cooled mixtures with 90 per cent alcohol other differences in solubility are developed. He also distinguishes these substances from one another by their behavior with glycerine, and a mixture of alcohol and ether; an emulsion of the

butter in ten parts of glycerine digested with a mixture of equal parts of alcohol and ether gives two layers of solution, with, in the case of pure butter and oleomargarine, no deposit of solid matters between them. Lard and suet give decided deposits between the layers, and starchy adulterations will appear there; on cooling the solutions new deposits appear that differ in appearance especially under the microscope; tincture of iodine added to the solution gives other deposits, which, especially for oleomargarine, present characteristic appearances under the microscope.

Full courses of the qualitative examination of the butter for both inorganic and organic adulterations are given by Dietzsch, Elsner, Liebermann and Medicus; but so many of the adulterants included in this examination are rarely used that no further notice of these courses is appropriate here.

The general usefulness of many of these simple tests is very questionable, while most of them will answer well enough for distinguishing oleomargarine butter pure and simple, or a butter made from tallow, lard, and oil.

The second method of Husson's may in skilled hands be valuable as a means of distinguishing different fats used for the adulteration of butter. In the performance of this as well as of any of the other tests the operator should be perfectly familiar by his own experience with the behavior of genuine butter under like conditions; I have found that such experience is quite essential in the few trials that I have had time or occasion to make of some of these tests; and I have found that even then quite considerable additions of oleomargarine to genuine butter may escape certain identification.

PARTIAL QUANTITATIVE TESTS FOR ADULTERATION WITH FOREIGN FATS.

Some of these tests are the only ones that give positive and incontrovertible evidence of this adulteration.

Ballard (9) makes use of the behavior of butter and other fats with ether at 18.5° for a quantitative estimation of foreign fats in butter; these fats when treated with a certain proportion of ether leave a much larger residue than pure butter leaves.

The Pharmaceutical Society of Leipzig offered in 1876 a prize of 300 marks for the discovery of a safe and practical method of testing cow's butter for adulteration with foreign fats. This prize was taken by *Hehner and Angell* (60). Their process depends on the fact that cows butter yields a certain notable proportion of fatty acids soluble in water, which are not present in other animal fats; they therefore separate out and weigh the insoluble fatty acids; of these they found genuine butter fat to yield 86.5 to 87.5 per cent, while beef and mutton fat and lard yielded 95.5 per cent. The fat, filtered while melted, is saponified with an alcoholic solution of potash, as suggested by Turner, the alcohol is removed by heat, the soap dissolved in water and decomposed by a mineral acid, the insoluble fatty acids collected on a weighed filter, and thoroughly washed, dried and weighed.

Bachmeyer (8) gets good results with this method; so also does *Kraetschmar* (79) but he thinks that a higher limit must be allowed for insoluble acids in genuine butter fat, for he obtained 89.6 per cent

in one instance; so also *Kuleschhoff* (80). *Bell* (12) made determinations of insoluble acids by this process in fifty samples of genuine butter, and obtained from 86 to 89.9 per cent. *Reichardt* (112) on the other hand claims that the highest limit allowed by *Hehner* and *Angell* is too high and that it should not be over 86.8, because mixtures of 10 per cent of lard with genuine butter yield only 87.4 to 87.9 per cent of insoluble acids. *Filsinger* (44) obtained 89 per cent of insoluble acids from a genuine butter, and therefore says that the highest limit must be raised; on the other hand he obtained from several artificial butters only 87.5 to 88 per cent of insoluble acids. *Sachsse* (119) found that considerable rancidity in the butter does not notably affect the results obtained; so also *Jones* (73), who found that the specific gravity may be raised or lowered by rancidity. *Fleischmann* and *Vieth* (47) examine 187 samples of butter by this method and also find a wider range of variation for insoluble acids than was allowed by *Hehner* and *Angell*; they were led to give special attention to the washing of the insoluble acids before drying to weigh; and instead of stopping when litmus paper was no longer affected, they continued till sensitive litmus tincture showed no acid reaction with the washings; they found that according as they washed with more or less care they obtained 87.5 to 90.5 per cent of insoluble acids from thirty samples of genuine butter; on using from 1.5 to 2 litres of water for washing instead of three-fourths of a litre they obtained from a large number of American and German butters but a trifle over 88 per cent of insoluble acids in the highest instance. Nevertheless, for some reason not given, they recommend that the highest allowable limit for insoluble acids in genuine butter be set at 89.8 per cent, and commend the process while saying that it would be more reliable if better means for washing the acids could be devised. *Muter* (98) shows that the insoluble acids must be boiled with water in order to wash them completely, and he does not allow them to solidify during the washing. *Blythe* (16) conducts the whole operation from saponification to the final washing of the acids in a weighed flask in which they are finally dried and weighed. *Hehner* (58) calls attention to the fact that the fatty acids increase in weight when kept at 100° C. for a long time. *Dietz-ell* and *Kressner* (28) show that the proportion of insoluble fatty acids yielded by vegetable fats is also high (95 per cent), so that the adulteration of butter with these oils can also be detected. *Jean* (70) modifies *Hehner's* process to avoid a source of error which he has observed, and which may account for the high yield of insoluble acids obtained by some analysts from genuine butter; he noticed that if the alkaline soap of the mixed soluble and insoluble acids is at once decomposed a portion of the former will be taken up by the latter and retained with much obstinacy; he therefore makes a magnesium soap by adding magnesium sulphate in excess to the solution of the soap; a soap of the insoluble acids is thus precipitated, which is collected on a filter and washed, and then decomposed by acid; the insoluble acids thus obtained are prepared for weighing in the usual manner. Good butter did not yield over 88.2 per cent of insoluble acids.

Muter (99) describes a long process for determining the yield of both insoluble and soluble acids; the former are determined in the usual manner: the filtrate and washings are saved, the total free acidity determined in them; then the total sulphuric acid, by precipi-

tation with barium salt; the combined sulphuric acid, by evaporation of a portion of the washings to dryness, and igniting and weighing the residue of potassium sulphate; thus all the necessary data are given for calculating the acidity in the washings due to the soluble fatty acids. *Dupre* (38) questions the reliability of this method, although he cannot account for the marvellously accurate results obtained by its author. He attains the same end more simply. A measured quantity of a normal alcoholic solution of sodium hydrate is used for saponification, and a slight and known excess of a standard acid is added to decompose the soap; the filtrate and washings from the insoluble acids are saved and titrated, and the acidity due to the soluble acids is easily calculated. *Jones* (74) describes a similar process: the acids are washed and weighed in a flask as described by Blythe above, but the saponification is conducted in a smaller, strong flask, closed with a rubber cork tied in, to prevent volatilization of the soluble acids during the operation. *Perkins* (105) saponifies, decomposes the soap by oxalic acid in slight excess, and washes the insoluble acids as usual, and saves the filtrate and washings; of these he distills off an aliquot part, and determines the acidity by titration; the insoluble acids he dissolves in alcohol, and titrates an aliquot part of this solution also.

Koeltstoerfer (77) takes advantage of the fact that the larger the proportion of pure butter in a mixture the larger, of course, the proportion of butyric and other acids with lower molecular weights. He uses for saponification an excess of normal alcoholic solution of potash, and by titration with half-normal acid determines the excess of alkali; he proved that one gram of pure butter required 221.5 to 233 milligrams of potassium hydrate for saponification, and one gram of other animal fats from 195.8 to 197 milligrams. He takes 227 milligrams as the average for genuine butter, and 196.5 for lard, oleomargarine, tallow, etc., and makes the process successful and quick. Like *Hehner* and *Angell's* method, it can be applied to rancid butter.

Hehner (59) first attempted to determine the soluble acids by distilling them off and titrating the distillate; but as he was unable to get the whole amount of from 6 to 7 per cent of volatile acids in the distillate, he gave up the method and turned his attention to the determination of the insoluble acids as above. *Heintz* (62) attempted the titration of the soluble acids in the mixture with the insoluble, without first filtering out the latter, but also without success. *Lechartier* (84) distilled off the volatile acids, saturated them with barium hydrate, evaporated, and weighed the residue: 50 grams of pure butter gave at least 6 grams of this salt, while oleomargarine butter did not yield a twentieth of this quantity; but the process is a tedious one. *Reichert* (111) by using always the same quantity of butter, of alkali for saponification dissolved in the same quantity of alcohol, adding the same quantity of acid for decomposing the soap, collecting a certain quantity of the distillate, and titrating it with a one-tenth normal alkaline solution, obtained very constant results; an average of 14 cc. of this alkaline solution being required to neutralize 50 cc. of the distillate from the acids yielded by 2.5 grams of the filtered butter fat, while for oleomargarine only 0.95 cc. of the alkaline solution was required, and for lard 0.3 cc. He affirmed that 10 per cent of any of these foreign fats, whether animal or vegetable, in butter, can be detected by this method, and that where the distillate requires only 12.5 cc. of the alkaline solution the butter may be considered as adulterated.

and *Scherer* (92) test this method with good results. *Meissl* (93) approves the test highly; but he takes twice as much butter and a weaker alcohol, 70 per cent instead of 80 per cent for the solution of the alkali for saponification, in order to avoid the loss of volatile acids by etherization during saponification; he tested 84 samples of butter by the method and concluded that if 110 cc. of the distillate from the acids yielded by 5 grams of butter required less than 26 cc. of one-tenth normal alkali for neutralization the butter should be regarded as adulterated. *Ambuhl* (2) says that this process possesses every advantage over *Hehner's*, and that nobody uses that now. He finds that the volatile acids from 2.5 grams of butter require for neutralization an average of 14.7 cc. of one-tenth normal solution of alkali.

In this connection reference should be made to the statement of *Dupré's* already alluded to, that unless the saponification of butter by an alcoholic alkaline solution is conducted in a closed flask, some loss will occur by volatilization of ethers formed during the process.

Husson (69, 68) treats the butter with ten times its weight of a mixture of equal parts of alcohol and ether; by the behavior of the butter with this solvent at different temperatures he determines the casein, margarine, oleine, butyrine and its associates, and water; the operations require much time and several weighings, and the strength of the solvents must be carefully adjusted, but results are obtained that in some cases, especially when combined with a microscopic examination of the products, might be valuable for confirmation of doubtful results obtained by quicker if less accurate methods. But without making so complete an examination as this in all cases, he tests for adulteration with foreign fats generally, by weighing the dried deposit left after this mixture, first heated to 30°C., has been kept at 18° for 24 hours; this deposit should not exceed 40 per cent of the butter nor fall below 35 per cent; if it is in excess the butter was adulterated with beef or mutton suet, if it is deficient oleomargarine or lard was used as an adulterant. *West-Knight* (133), precipitates from the solutions of the acids of the butter obtained by saponification, etc., the oleic, palmitic and stearic acids as barium salts; the salts of butyric acid and its associates are not precipitated; the method does not look promising.

Tests for adulteration with water and other matters not fat.

v. Babo (7, 46), pours over a certain volume of the butter in a graduated tube, the butter being melted in the tube by a gentle heat in order to facilitate the correct reading of its volume, the same volume of ether, and mixes by shaking till the butter is completely dissolved; then to hasten the complete separation of this solution from the particles of water and other matter suspended in it, he puts the tube in a tin cylinder to the neck of which a strong cord is fastened, attaches the other end of the cord to a small roller in the end of a stout stick about eight feet long, plants the other end of the stick in the ground and gives its upper end such a rotary motion as to cause the cylinder to fly off and revolve in a nearly horizontal plane very rapidly; by this means after 60 to 80 revolutions the separation of the two liquids is made quite complete, and their line of demarcation is sharply defined. *Heeren* constructed a butyrometer for use on this principle which was attached to a horizontal wheel that could be rapidly revolved; the butter was however not dissolved in ether but simply melted in the grad-

uated tube; after revolution for two minutes the fat was completely separated from the other matters. Of twenty-one samples of butter examined in this way not one yielded less than 82 per cent of fat by volume, but the butter which contained the most fat was not always the highest priced sample. A similar and better instrument has been constructed by *Lefeldt* which gave nearly as good results as could be obtained by the gravimetric method. *Birnbaum* (13) applied *v. Babo's* simple centrifugal apparatus with melted butter, and after 60 to 80 revolutions obtained a sharp demarcation between the fat and the water and other matters; or if the tube was kept in warm water for a considerable time and occasionally revolved rapidly by rolling it in a vertical position between the palms of the hands a very fair separation of the water from the fat was obtained. *Hoorn* (64) in a graduated tube with a narrower graduated part at the lower end, melted 10 grams of butter and mixed it with 30 cc. of petroleum ether by shaking; the water and other matters not fat collected in the narrower tube; calling a cubic centimetre of these matters one gram he found usually 12 to 14 per cent in good butter, and over 20 per cent only in adulterated butter; the result is more reliable if the first etherial solution is decanted off and the residue is shaken up with a fresh quantity of the ether. All other adulterations that are not fatty will remain with the water. *Jean* (70) exhausts 40 grams of the butter with ether or carbon disulphide, evaporates the extracts to dryness and weighs; the difference gives water, caseine, salts and other matters. *Johanson* (71) gets very good results with a method precisely like *Hoorn's*.

In monograph works *Blythe* (14) describes for the testing for *foreign fats* only Jones's method as modified by himself. The *water* he determines by drying a gram on the water bath, the *fat* by melting it in this dried residue and decanting off as much as possible, and dissolving out the rest with ether, and the *ash* by ignition; the difference between the sum of these and the weight of butter taken gives the *curd*. *Dietzsch* (29) for *foreign fats* describes only *Hehner's* method, but he admits, that in view of the conflicting statements as to the limits to be allowed for insoluble acids in pure butter, the method affords no guarantee of accuracy, and needs further examination; he has himself obtained in several cases from 88 to 88.2 per cent of insoluble acids from artificial butter, and never over 87.5 per cent from genuine Swiss butter. For *water and other matters not fat* he follows the methods first given by *Duflos* and *Hirsch* in 1842 (36) which consists in melting a considerable quantity of the butter in a weighed cylinder with twice its weight of water, the cylinder being inverted and corked, and, after the melted fat has become clear setting the whole aside till the butter solidifies and then removing the cork and draining off the water with the curdy particles suspended in it; the residue of butter in the cylinder is then weighed.

Fleischmann (46) for *foreign fats* with *Hehner's* methods obtained from 89 to 90.7 per cent of insoluble fatty acids from samples of genuine cow's butter, and states that *Hehner's* limits thus appear to be too low; and the real limit is so near the lowest for oleomargarine as to detract much from the value of the method — and that for butter from milk of other animals *Hehner's* rule does not hold. *Griessmayer* (52) gives for the examination for *foreign fats* *Hehner's*, *Koettstorfer's* and *Reichert's* methods without criticism; for *water and other matters not fat* he follows *Duflos* and *Hirsch*: *Hassall* (56) for *water and other matters* melts the butter in a tube and gauges the

proportion of these matters by the space that they occupy, and says that the test should be taken from the middle of the piece of butter, as the outside may have lost its surplus water.

Husson (68) gives only his own method for the examination for *foreign fats* already described above; for *water, etc.*, he gives a method essentially like that of *Duflos* and *Hirsch*; he observes that when a knife is plunged here and there into butter which has been loaded with water, droplets of the liquid appear in the track of the knife, and that butter with an excess of water is granular and crumbly. *Elsner* (39) describes for the examination for *foreign fats* *Hehner's*, *Koettstorfer's* and *Reichert's* methods, and commends them all as reasonable; for *water, etc.*, he follows *Duflos* and *Hirsch*. *Liebermann* (86) mentions no method for *foreign fats*, and for *water, etc.*, follows *Duflos* and *Hirsch*. *Medicus* (91) for *foreign fats* describes *Hehner's*, *Reichert's* and *Koettstorfer's* methods, and also *Perkins'* with an unfavorable comment; for the *water, etc.*, he takes up the fat with ether and separates it from the water and other matters by decantation.

Results of the examination of samples of butter received from the Inspectors under the State Board.—This examination was confined to the test for *foreign fats* and for *excess of water and other matters not fat* and to the *microscopic examination* of such samples as proved to be oleomargarine butter. For *foreign fats* *Reichert's* method was followed with much satisfaction; when all the necessary solutions are once prepared the analysis is made with comparatively little trouble, with less, in fact, than is allowed even by those who praise it most; its author says that a current of air must be passed through the liquid in the flask while the distillation is going on, to prevent bumping, and *Ambuhl* says that all attempts to dispense with this precaution by the use of pumice stone, platinum scraps and the like failed. Nevertheless, finding it very inconvenient to use the current of air, I ventured to try a combination of short spirals of platinum wire and pieces of pumice stone together, and with complete success; the ebullition continued from beginning to end as quietly as could be desired.

For *water and other matters not fat* *Hoorn's* method was adopted, after several unsuccessful attempts with the method of *Duflos* and *Hirsch*, which is given in so many of the monograph works. This method appeared to be altogether too clumsy and inaccurate, for most of the curd, after first settling to the bottom of the water, would soon rise to the lower surface of the butter and adhere there when the butter solidified, and it could not be removed without carrying away also considerable quantities of fat. Where such wide variations must be allowed in the proportion of water in butter, as has already been shown, it seemed to be unprofitable to take more time and make more accurate determinations than would be yielded by *Hoorn's* method. About 10 grams of the butter were put in a tube graduated to tenths of cubic centimeters and melted by immersing the tube in warm water; the volume of the melted butter was then noted, the petroleum ether added, and after corking the tube the solution of the fat was effected by vigorous shaking; then, after standing three or four hours, the volume of the matters not fat collected at the lower end of the tube was noted and the per cent by volume calculated.

My results are set forth in the following table; the figures in the third column represent the number of cubic centimeters of one-tenth normal solution of alkali, required to neutralize the acids in the first 50 cc. of the distillate from the fatty acids yielded by 25 grams of butter.

Inspector's number of sample.	Trade designation.	Cubic centimeters of alkaline solu- tion required.	Volume per cent of water, etc.
122a	Oleomargarine butter procured at my request,	*1.5	
122b	Oleomargarine butter procured at my request,	*1.7	
236	Dairy butter, costing lb. 29c	14.9	14.79
237	Dairy butter, 30c	13.7	14.53
238	Cooking butter, 18c	13.	15.55
239	Dairy butter, 25c	13.1	22.58
240	Best creamery, 40c	13.5	15.21
241	Best dairy, 44c	13.6	15.15
242	" creamery, 38c		19.53
243	Good dairy, 26c	14.	16.01
244	Fair dairy butter, sold at	20c	14.26
289	Butter 32c	*1.	10.66
290	" 32c	*1.3	15.22
291	" 20c	12.8	16.87
292	" 20c	*1.6	13.79
293	" 22c	13.7	19.55
294	" 26c	*1.6	10.80
295	" 26c	12.7	30.75
296	" 26c	15.3	11.17
297	" 24c	14.5	14.94
331	Dairy butter, 28c	*1.6	10.
332	Splendid dairy butter, 30c	13.	14.79
333	Extra fine dairy, 33c	13.8	12.32
334	Splendid dairy, 30c	15.5	13.19
335	Creamery butter, 32c	*2.2	
336	Good dairy, 30c	14.8	26.27
337	Roll butter, 35c	*1.8	7.74
338	Good creamery, 28c	14.7	12.80
339	Fair table, 25c	15.3	18.15
340	Dairy butter, 30c	*2.1	9.71
357	Genuine dairy, 30c	14.1	16.52
358	Roll butter, 27c	*2.7	9.62
366	Good dairy butter, 30c	*10.2 11.6 11.4	15.56
2001	Butter, 36c	12.8	15.
2002	Butter, 26c	15.9	11.47
2003	Oleomargarine butter, acknowl- edged to the inspector, Mr. Munsell, 26c	*	12.71
2004	Oleomargarine butter, acknowl- edged to the inspector, Mr. Munsell, 26c	*	8.84
2005	Oleomargarine butter, acknowl- edged to the inspector, Mr. Munsell, 20c	*	11.52
2006	Butter, 30c	15.5	23.32
2007	" 48c	14.9	16.16
3102	Best country butter, from my own table, 32c	14.1	
3103	Best country butter, from my own table, 32c	13.9	
2016	Western butter, 14.4		10.45
2017	Butter, acknowledged by seller to be mixture of lard and butter, *5.4		13.27

Samples *122a and 122b were bought for oleomargarine butter at my request, that I might test my method of analysis—and for the same reason samples 3102 and 3103 were taken, one from my own table and the other from the table of a friend, in order to test the process by butter known to be genuine; these four were the first samples examined. The oleomargarine butters designated by an * are betrayed at once by the test. In the case of *335 the inspector stated that the seller acknowledged it to be a mixture of oleomargarine and real butter, and that it was made in Ohio, at large factories, where oleomargarine is mixed with cream and churned; and he calls it creamery butter because it is made at a factory and not on farms or at small dairies. The result of the analysis shows that very little cream was put into the churn with the oleomargarine. In the case of *358, the seller was made by the inspector to acknowledge that it was oleomargarine butter, and he gave the information that the practice is quite common to put such butter up in rolls and stamp it.

On receiving these letters from the inspector I took no particular notice of the numbers of the samples, and forgot them long before I made the analyses; now, on the occasion of writing this report the numbers of the samples and the inspector's statements in regard to them are brought together for the first time; my results are in full accord with these statements, and the reliability of the test is confirmed, if indeed it needed any confirmation. Three determinations of volatile acids were made with *366, because it was the only sample that seemed to be a mixture of genuine butter and oleomargarine; the last two tests were made with great care, while the first was made with less particular observance of all the necessary precautions.

As those who have most carefully tested the method of analysis in Germany have decided that where a sample of butter examined in this manner requires less than 12.5 cubic centimeters of the standard alkaline solution ($\frac{1}{8}$ normal) to neutralize the volatile acids yielded by 2.5 grams of the pure fat of the sample, it is to be regarded as adulterated with foreign fats, and as the quantity of alkali required in this case falls so much below that required in the case of every other sample examined by me, that was not oleomargarine butter pure and simple. I therefore conclude that this sample *366 was taken from a mixture of genuine butter with oleomargarine. Samples *2003, 4 and 5 were not tested for foreign fats because since the sellers acknowledged to the inspector, Mr. Munsell, that they were oleomargarine butters, there appeared to be no object in testing them.

As to the determination of water and other matters not fat, allowance must be made in some cases for the fact that the examination was not made till quite late; the water had collected in a few instances in the cavities left on taking out the small samples some time previous for the determination of volatile acids, so that it was difficult to get samples for these last determinations without too much or too little of this water. But it was noticed that in just those cases, viz.: *239, 242, 293, 295 and 2006, where the analysis indicated an excess of water there was an unusually large collection in these cavities; second determinations were made of water, etc., in the worst of these cases, after pouring out all that had collected in the cavities; they then, of course, yielded less water, but in the case of *295 the proportion was still as high as 27 per cent; this is lower than it should be, because some of

the water of the portion tested had unquestionably escaped into the adjoining cavities and was poured out with the rest. This butter was undoubtedly adulterated with water, since 20 per cent of foreign matters of all kinds is the highest allowed by any authority. As to the other samples which yielded so large a per cent of foreign matters not fat it can only be said with certainty that they are suspicious. I did not expect to find this kind of adulteration and therefore did not examine the samples for it at once on their arrival; when the tests were made at last, it was rather with the expectation of proving that such adulteration does not occur in our butter trade.

Microscopic examination of oleomargarine butters.—This examination was made mainly for the purpose of ascertaining how generally the statements of *Piper* (p. 514) concerning objects found by him in western oleomargarine butters apply also to butters of this class as sold in New York. As the general result of my examination I may say that, while in one sample I found indications of bacteria, and in another of fungoid vegetation, and of remains of tissue in several, these objects were of rare occurrence, and I do not consider it as proved that some of them may not be found in genuine butter of poor or ordinary quality with as much frequency; therefore, till I shall have subjected as many genuine butters to the same rigid examination, I cannot be prepared to say that their occurrence is characteristic of oleomargarine butter.

CHEESE.

Literature.—The subject of the adulteration of cheese receives only brief mention either in the journals or in monograph works on adulteration of food.

The Analyst (1881, p. 29) quotes from the Chicago Journal of Commerce the statement that soapstone, soda and potash are added to cheese.

Hassall (56) states that cheese is adulterated with potatoes in Thuringia and in Saxony, and that bean meal is sometimes added in the place of potatoes; that Venetian red has been detected in several cases in the coloring of the rind, and as this color sometimes contains lead, and the rind is sometimes eaten, the fraud may be dangerous. He also says it is stated that blue vitriol and arsenic (green?) are sometimes added, perhaps to give the appearance of age to the cheese, but he has never found them.

Elsner (39) says that adulterations of cheese are not known. He mentions oleomargarine cheese as an article recently introduced in Germany. *Griessmayer* (52) also says that cheese is not adulterated; but he mentions in appropriate terms a practice of soaking certain kinds of cheese, such as Limburger, in urine in order to give them in a short time the appearance of ripeness; such cheeses can be made to show the reaction for murexide. He mentions the possible occurrence of poisonous metals, as copper, lead or zinc, in cheese, owing to carelessness in keeping it in metallic vessels or wrappings.

Fleischmann (46) quotes the results of Vogel's examination of cheese for lead; beyond two inches from the rind no lead was found even in cases of cheese wrapped in very inferior tinfoil containing much lead; but in such cases lead was detected in the portions of the cheese im-

mediately under the rind; 0.56 per cent of lead was found in one instance in the rind of a cheese wrapped in tinfoil containing 15 per cent of lead. Such cheeses are so little used in this country, however, that this matter has no general importance; but the information may serve as a warning to those who do eat them to be careful of eating the rind.

The same author mentions also the use of veratrin, sulphate of zinc and arsenic to give to green cheese the strong, biting flavor of old cheese, and the addition of blue vitriol to the milk in order to prevent huffing of the cheese.

Liebermann (86) mentions the danger in metallic wrappings, and states that verdigris is sometimes sprinkled over the cheese to give it the appearance of age. *Blythe* (14) states that washes containing arsenic and lead have often been applied to ward off flies, and as some people eat the rind, such practices may be dangerous.

Lard cheese.—About ten years ago dairymen were much concerned lest the manufacture of cheese from skimmed milk and oleomargarine should seriously injure the reputation of American cheese abroad, and in that way hurt the dairyman's business here. Whatever chance this mode of making cheese may have had for success, it is now quite supplanted by the lard cheese which is made at over twenty factories in this State, under patents issued to H. O. Freeman in 1873, and to William Cooley in 1881.

In this process an emulsion of lard is made by bringing together in a "disintegrator" lard and skimmed milk, both previously heated to 140° Fahr. in steam-jacketed tanks; the "disintegrator" consists of a cylinder revolving within a cylindrical shell; the surface of the cylinder is covered with fine serrated projections, each one of which is a tooth with a sharp point; as this cylinder revolves rapidly within its shell, the mixture of melted lard and hot skimmed milk is forced up in the narrow interspace, and the lard becomes very finely divided and most intimately mixed or "emulsionized" with the milk. This emulsion consists of from two to three parts of milk to one of lard; it can be made at one factory and taken to another to be used for cheese, but it is usually run at once into the cheese vat.

In making the cheese a quantity of this emulsion containing about 80 lbs. of lard is added to 6,000 lbs. of skimmed milk, and about 600 lbs. of buttermilk in the cheese vat, and the lard that does not remain incorporated with the milk or curd, usually about 10 lbs., is carefully skimmed off. These quantities of the materials yield 500 to 600 lbs. of cheese, containing about 70 lbs. of lard, or about 14 per cent; about half of the fat removed in the skimming of the milk is replaced by lard (Munsell). It is claimed that no alkali or antiseptic is used, and that only the best kettle-rendered lard can be employed, because of the injurious effect of any inferior article on the quality of the cheese, and that before even this lard is used it is deodorized by blowing steam, under 80 lbs. pressure, through it for an hour.

According to many witnesses the imitation is excellent, for experts have been unable to pick out lard cheeses from a lot of these and full cream cheeses of good quality together; and it may therefore be safely presumed that the general public would be quite unable to distinguish one from the other.

The statistics of the manufacture of this kind of cheese as gathered from various sources, and partly by Inspector Munsell are about as

follows: Thirteen of the "disintegrators" are in operation, all in this State, and none elsewhere. The production of cheese at the twenty-three factories engaged in the manufacture in this State during the six months ending November 1, 1881, was stated to amount to 800,000 lbs. None is made in other States, although it was stated before the *Assembly Committee on Public Health* (43), in 1881, that it was made at the West. Before the same committee it was stated that some of the cheese was sold in New York city for consumption, but according to the best of my information, most if not all of it is exported. It is claimed that it brings from eight to ten cents a pound when full cream cheeses sell at twelve cents, and "full skim" cheeses at four to five cents; but New York dealers tell the inspector that the cheese brings but four cents a pound when its true character is known, and that is for exportation only. The inspectors have not been able to find any cheese in the city markets which they had any reason to suppose to be lard cheese.

In two respects this kind of cheese can be considered as a fraud under the new food and drug law, unless sold under its distinctive name. It contains less fat and fat of a cheaper kind than the ordinary full-cream cheese contains, and secondly, there are some grounds for the belief that the fat which is substituted for the butter fat is less wholesome than that. *Rubner* (117) in some investigations on the assimilation of various articles of food by the human subject found that lard was less digestible than butter; and the objection to oleo-margarine butter on the ground of its indigestibility as compared with genuine butter (p. 514) may apply perhaps with more force to lard cheese; it only remains to determine by experiment whether the digestibility of the substances is increased by the operation of emulsifying. The question of the digestibility of this cheese as compared with other kinds could be satisfactorily determined only by a series of comparative digestion experiments, after the fashion of *Rubner's* investigations.

"*Skim cheese*," "*anti-huff cheese*."—Cheese is made, as is well known, from "full skimmed" milk, without any attempt to replace the fat removed for butter; it is doubtful whether such cheeses are anywhere sold in a way to deceive consumers as to their character. To improve the quality of these cheeses and especially to prevent them from puffing out or "huffing" as it is technically called, from the abnormal generation of gases in the interior before they become fully ripe, patented "anti-mottling" and "anti-huffing" extracts are employed, consisting, it is claimed, only of caustic and carbonated alkali, saltpetre and a little annatto for coloring, dissolved in water. A qualitative analysis of one of these extracts by both Mr. Munsell and myself confirmed this claim in one case; but another extract, said to be used at the West, was found to consist almost entirely of borax which is a well known antiseptic. The quantity of alkali and saltpetre said to be added to the cheese in this operation is small, in all less than five ounces to the milk and sour buttermilk for 100 pounds of cheese, and a portion of this must remain in solution in the whey; and there is no satisfactory evidence that such a quantity of borax as could be added to the cheese without affecting its taste would be prejudicial to the health for any ordinary quantity of cheese eaten. *Gruber* (52 a) shows that when this substance is taken into the system it seems to leave the organism very quickly and without affecting the system in any injurious manner.

As to the *statistics of the manufacture of anti-huff cheese*, it is stated that in the most important section of this State for dairy products 4,500 cheeses of the best quality were made this year of skimmed milk and sour buttermilk with the aid of this extract. Before the *Assembly Committee* (43) it was affirmed that this cheese is consumed to some extent in this country, but most of it is exported. It is claimed that nearly the same prices are obtained for the cheese as for full cream cheese, and that it is a good and wholesome article of food, containing nothing but what is found in other food. On the other hand it is asserted that the excessive quantity of alkali supposed to be in the cheese makes it unwholesome, and that like the lard cheese it is a fraud on the public unless sold under a distinctive name; bringing nearly the prices of a full cream cheese, it is taken by consumers to be such. As to the first point there is no evidence pro or con, and the presumption is, as above stated, that there is no excessive quantity of alkali in the cheese; as to the latter point, it can be left to the interpretation of the law; without question a valuable constituent of the cheese has been removed and nothing of the same character has been substituted for it.

Water and fat determined were in small samples, each one of skim cheese made without anti-huffing extract, and with it; both samples were taken with an ordinary cheese-tryer by Mr. Freeman, the patentee of the process, and sent through Mr. Munsell to me. The results of this partial analysis are given below.

	Water.	Fat.
Anti-huff cheese.....	47.56	14.48
Ordinary skim cheese.....	47.00	16.77

There is nothing unusual in the composition of these samples, as compared with skim cheese in general.

Poisonous cheese. — A sample of cheese, said to have produced sickness on the part of those who ate it, was sent to me by the Secretary of the Board, who received it from Inspector Smith. Cases of so called "poisonous cheese" occasionally appear in different parts of this country, and in other countries. *Husemann* (67 a), quoted by *Fleischmann* (46), mentions a number of instances from all parts of Germany, and also in England and Russia, resulting from eating old and especially sour milk and soft rennet cheeses. Scarcely ever is the result fatal, and recovery is rapid, because the vomiting which is among the first symptoms relieves the system of the dangerous matter. *Voelcker* (131 a) after noticing cases of sickness produced by cheese containing copper or zinc sulphate, that had been added often surreptitiously by the dairymaid to prevent "heaving" of the cheese, gives an account of a case where all the cheese of a certain "make" sold in different places produced sickness; the cheese presented nothing abnormal in appearance, but his assistants on eating less than a quarter of an ounce of it were taken with violent vomiting and pain in the bowels, and a disagreeable mercurial after-taste was left in the mouth; no metallic poisons could be found in it however, nor any thing else abnormal except an apparently larger quantity than usual of fatty acids, giving a strong acid reaction to the cheese. He suggests that the poison is identical with the so called sausage poison of German sausages made largely from coagulated blood, and says that a similar poison appears to be generated sometimes in pickled

salmon, smoked sprats, pork or tainted meat, and that rancid butter may act as a poison. It disappears from the cheese when quite decayed. I have on previous occasions examined such cheese both chemically and with the microscope, without finding any cause for the physiological effect produced by it, or any thing unusual; in one case the cheese was excellent in quality otherwise, but it nevertheless when eaten to test the truth of the allegation against it, made me quite ill with the usual symptoms for a short time.

In the present instance some of the cheese was offered to some kittens which are kept in stock for the use of the anatomical department of the University; at first only one would eat it, and that one appeared to be quite sick the next day. After her recovery this same kitten ate of the cheese again without any noticeable ill effects, and several others also ate of it without harm; it appears, therefore, that the illness of the first animal may as well have been caused by over-eating of rich food as by any supposed poisonous character belonging to the cheese.

I examined the cheese for poisonous metals in the rind, and for matters of the nature of alkaloids in the other part; no metals were found. With respect to the second test, a very small quantity of a substance, precipitated by alkali, soluble in ether, and giving with platinum chloride a yellowish, flocculent precipitate was obtained; these reactions indicate an alkaloid, but I have not been able as yet to carry the examination any further, and, moreover, it is not at all unlikely that a substance of the same character may be found in any ripened cheese as one of the normal products of the putrefaction; therefore, this result obtained with the poisonous cheese can have no significance till normal cheese has been examined in the same manner without finding any evidence of the presence of alkaloids. For the present, therefore, we can only repeat what others have said, who have given this matter their attention, that the cause of this peculiar property of cheese is probably an unknown organic substance, resulting from an abnormal process of ripening.

LARD.

Literature.—According to older writers on the subject of adulteration this substance was frequently adulterated. *Hassall* (56) says that it is extensively adulterated with water and starchy matters to make weight, and with salt, alum, potassium and sodium carbonates; and lime—as milk of lime—to increase its capacity for water, the cheapest make-weight of all; good lard contains no water. *Hoskins* (67), writing in 1861, states that this adulteration of lard was very common then, as much as twenty-five per cent of water being sometimes found in it. *Dietzsch* (29) says that water and lime are the chief adulterants, sometimes to the extent of forty per cent, but that other substances, such as chalk, plaster, clay, starch and flour, are rarely added. *Elsner* (39) says that sunflower-seed oil is sometimes used as an adulterant, and often water, with borax, soda or lime. Other writers, accessible to me, do not mention the subject, and there is no literature concerning it in the journals, with the single exception of the *Bulletin of the National Board of Health*, in Supplement No. 11, where Dr. Smart states that the quality of the samples of lard purchased in Washington was so uniformly excellent that he discontinued the examination.

The detection of these adulterants mentioned above, especially of water and alkaline substances, is easy. On keeping the lard in a melted condition for a short time the water and other impurities collect at the bottom, and if milk of lime, soda, or any other alkaline substance was added also, the water will show the usual alkaline reaction with litmus or turmeric paper; after the lard has solidified on cooling a channel is made through it to the water, and the latter is poured out and weighed for a rough determination of the percentage of impurities; this water can then be examined chemically for matters in solution, and if it is turbid, as is often the case, it can be examined for starch with the microscope by which the addition of potato flour would be indicated.

Results of my examination of lard.—Twenty-eight samples were received, mostly from Mr. Colby. They varied widely in quality—some were pure white in color, granular in texture, and free from any unpleasant odor; others had a texture reminding one of cotton, and emitted a disagreeable odor, which was much worse when the samples were melted; some again melted quickly to a clear oil, while others would not yield a clear liquid even when kept melted for hours. Aside from the question of adulteration, some of these lards which were sampled for me could not be considered as agreeable or as wholesome articles of food.

Results :—

Inspector's No.	Price per pound.		Analysis.
233	14 cents.		No water.
234	15 "		7.5 per cent water.
235	15 "		No water.
245	18 "		Little water.
246	16 "		No water.
288	16 "		7 per cent water.
340	17 "		6.3 per cent water.
341	16 "		No water.
342	16 "		No water.
357	17 "		No water.
359	20 "	(leaf lard)	No water.
360	17 "		No water.
361	16 "		No water.
362	17 "		4 per cent of water.
363	16 "		No water.
368	18 "		No water.
369	13 "		6.7 water.
370	18 "		No water.
371	17 "		1 per cent of water.
372	16 "		5.5 per cent of water.
373	15 "		Very little water.
374	15 "		2.3 per cent of water.
375	13 "		No water.
376	16 "		Very little water.
2008	18 "		No water.
2009	18 "		4.5 per cent water.
2010	15 "		4.5 per cent water.
2011	13 "		No water.

My results prove that the practice of watering lard prevails to some extent, but in no case did the proportion of water reach the high figures mentioned by some writers, and in no case was the water alkaline.

OLIVE OIL.

Literature. — According to all accounts olive oil appears to be one of the most largely and variously adulterated of all substances put upon our tables. Of course nothing can be added to it to make weight except cheaper oils, since it is a clear fluid at common temperatures, and will not take up water or salts of any kind. Poppy oil, cotton-seed oil, ground or peanut oil, sesame oil, rape-seed oil, colza oil, and even coal oil are mentioned as being used for this adulteration; and beech-nut oil, which is manufactured on a large scale in Germany and used as a substitute for olive oil, can of course also be used, and very likely is used as an adulterant.

In one of the older numbers of the *Chemical News* it is stated that cotton-seed oil is refined in England and sent in enormous quantities to Italy, notoriously for the adulteration of olive oil; and the ground nut is largely raised in Africa for its oil which is often sold in commerce as olive oil (*Johnson's Cyclopædia*).

There is no evidence that any of these adulterants are injurious to health, and their use is in violation of the law only in that a cheaper article is substituted for a dearer one with fraudulent intent. The occurrence of poisonous metals, such as copper and lead, may be a more serious matter from a sanitary point of view, although the quantity of these metals that might be taken into the system in the quantity of oil ordinarily consumed may be of small importance. Lead is added to correct rancidity and may remain dissolved in the oil (*Liebermann 86*); copper is used as acetate (*Caillaud 20*) to give to any cheaper oil, such as ground-nut oil, a greenish tinge, and the mixture is then sold as Malaga olive oil.

The detection of these adulterations and especially the identification of the oil used as an adulterant is beset with much difficulty. Nearly all the study of oil testing has had special reference to the adulteration of olive oil, and still there is no quick and satisfactory way of detecting these adulterations; evidence of the difficulty of this detection is found in the offer by the Chamber of Commerce of Nice (23), in 1869, of a prize of 15,000 francs for the discovery of a simple, rapid and practical method of detecting adulterations of olive oil.

As I find no reference to the matter since that time I conclude that the prize has never been taken.

Methods that have been proposed for the detection of adulteration of olive oil may be arranged under several heads.

A. Methods based on specific gravity or solidifying point.

B. Methods based on changes in consistency, produced by certain chemical agents, or the elaidin test.

C. Methods based on changes in color, produced by certain chemical agents.

D. Spectroscopic tests.

E. Miscellaneous tests.

A. Methods based on differences in the specific gravity of different oils, and in their solidifying point.—Olive oil has a lower specific gravity than most oils used for its adulteration. (Watts' Dictionary, iv, 180; Wurtz's Dictionnaire, ii, 40.) Payen (103) and Wurtz mention special aræometers for testing olive oils, some being constructed for the detection of particular oils; it is stated by Lefebvre (85) that if a mixture of olive and poppy oils is allowed to stand quietly for eight or ten days a partial separation of the two oils will take place, and the heavier oil will preponderate at the bottom, and by taking that part of the contents of the bottle for the test the aræometer will more distinctly show the adulteration. Oleometers are constructed for testing at 15° (Lefebvre), or at 100° (Laurat). Donny (32) makes the specific gravity test simply by coloring a drop of genuine olive with alkanet, and depositing it in the suspected oil; it should remain stationary if the oil is pure. Scheibe (120) gives 0.923 for the specific gravity of cotton-seed oil, and 0.912 for olive oil, and holds that the specific gravity test and the elaidin test (see below) are the only means of detecting cotton-seed oil in olive oil.

From the meagre references to specific gravity tests of olive oil, in recent writings on the subject, it may be inferred that but little dependence is placed on it at present. Dietzsch (29) says that the test is useless, unless the adulterating oil makes up fifty per cent of the mixture.

Pure olive oil becomes whitish and opaque at from 6° to 8° C., while poppy oil does not assume this condition till the temperature falls to from -8° to -12° C.; a mixture of the two oils will congeal at a temperature between these points, and by taking advantage of the partial separation of the two oils by gravity, as mentioned above, any considerable adulteration with poppy oil may be detected by comparing the behavior at 6° C. of a sample taken from the top of the bottle with one taken from the bottom. Dietzsch (29) makes more account of this than of the specific gravity test; but as he puts the solidifying point of the best Provence olive oil at 2.5° C., while sesame oil begins to solidify at 0° C., this common adulterant might easily escape detection. Cotton-seed oil solidifies at -2° C., and ground-nut oil at -3° C. But according to him, as well as Payen, poppy oil endures a much lower temperature than olive oil before solidification.

B. Changes in consistency produced by chemical agents; the elaidin test.—Poulet (109) mixes the oil intimately with one-twelfth of a solution of 6 parts of mercury in 7.5 parts of nitric acid of 38° Baumé, and lets it stand twenty-four hours; poppy oil, especially, delays the solidification of the oil, and an addition of one-tenth can be detected. Dumas (36a) says that the method is in constant use. Boudet (17) substitutes a solution of hyponitric acid in nitric acid for the mercuric solution, but Dumas says that this is not so safe a test. Barbot (10) uses a solution of binoxide of nitrogen in nitric acid. Grace-Calvert (22) uses first nitric acid (sp. gr. 1.33), and then sodium hydrate solution (sp. gr. 1.34), or a mixture of nitric and sulphuric acids, and then sodium hydrate, or a solution of alkali alone, and then boiling; ground-nut oil becomes solid in five minutes with this last treatment. Cailetet (21, 140) uses a solution of hyponitric acid in sulphuric acid, which is also used by Roth (116), who passes a slow current of hyponitric acid through sulphuric acid of 40° Baumé for six to eight

days. A full account of the method and the reactions is given by *Grandeau* (51), who speaks very highly of it, and says that Roth's essay on this subject was rewarded with a prize by the Société Industrielle de Mulhouse. *Nicklès* (101) uses lime, slaked to a dry powder with water, especially for apricot oil; if 1.5 grams are added to 10 grams of the oil, and the mixture is boiled and filtered hot the filtrate remains clear if the oil is pure; but if one-tenth of apricot oil is added the filtrate becomes turbid; he thinks that poppy and ground-nut oil give the same reaction, but he was not sure that he had pure oils to work with. *Lailler* (82) uses a solution of chromic acid and nitric acid, which with pure olive oil gives after several days a solid mass; and he considers it safe to say that any oil which does not behave in this manner is adulterated. *Reynolds* (114) detects cotton-seed oil by a solution of mercuric nitrate, which gives with pure olive oil a hard brittle mass, but a doughy mass if cotton-seed oil is present. *E. Kopp* (78) adds to ten volumes of oil, one of concentrated nitric acid, and a few pieces of copper; as soon as the gas bubbles up through the liquid freely the whole is stirred together, and after a few minutes stirred again, and the mixture is put in a cool place; the purer the oil is, the sooner solidification follows, and the whiter and harder the elaidin. *Scheibe* (120) holds that the specific gravity test (see page 536), and the elaidin test furnish the only safe means of detecting cotton-seed oil; if present in the olive oil, the solidification is more or less imperfect, and the oil is colored brown.

Dietzsch (29) prefers Barbot's method, as used by Kopp, above, but takes equal volumes of the acid and the oil; he states that after three to six hours Provence oil yields an almost white, buttery mass, but sesame oil a red color, beech-nut oil, reddish-yellow, rape oil and cotton-seed oil, brown, while the solidification is delayed from ten to twenty hours, by these adulterants; poppy oil does not solidify at all.

Other recent works consulted by me do not mention the subject.

C. Tests by changes of color produced by chemical reagents.—*Barbot* (10) notes the changes of color produced by 2 grams of a saturated solution of binoxide of nitrogen in nitric acid, mixed with 20 grams of the oil, while *Dissel* (30) uses nitric acid alone. *Heydenreich* (61) uses only sulphuric acid, one drop of which is added to ten or fifteen drops of oil, on glass over white paper. *Peuot* (104) uses in the same way 20 drops of oil and a drop of a saturated solution of potassium dichromate in concentrated sulphuric acid. *Behrens* (11) mixes with the oil about its own volume of a mixture of equal parts of sulphuric and nitric acid, which gives a bright green with sesame oil and distinguishes it from all others. *Calvert* (22) gives an elaborate series of color reactions with sulphuric acid of different densities, nitric acid of different densities, sulphuric and nitric acids together, nitric acid followed by sodium hydrate and aqua-regia, followed by sodium hydrate. *Cailletet* (21,140) uses a mixture of dilute sulphuric acid and concentrated nitric acid, a solution of hyp-nitric acid, in nitric acid, and also brings together mercury, concentrated nitric acid and the oil, thus getting the combined action of mercuric salt and binoxide of nitrogen dissolved in nitric acid. *Chateau* (24,140) uses for a general method of analysis of commercial oils, liver of sulphur, syrupy zinc chloride, concentrated sulphuric acid, fuming

stannous chloride, syrupy phosphoric acid, and mercuric nitrate alone and in conjunction with sulphuric acid. *Hauchecorne* (57) used peroxide of hydrogen, but afterwards preferred concentrated nitric acid; he gives the colors yielded by several *crude* oils. *Langlies* (83a) gives particulars as to the strength of acid used. *Dragendorf* (33) gives color reactions of oils with ferric chloride. *Flueckiger* (48) remarking that the value of the color reactions with concentrated sulphuric acid is materially lessened by the carbonization and blackening that soon sets in, makes the valuable suggestion that, as carbon disulphide gives no colors at all with the acid, it can be used to dilute the oil.

Wideman (134) describes some reactions of refined cotton-seed oil; it gives a violet color with concentrated sulphuric acid; a blood-red color and much evolution of sulphurous acid with sulphuric acid and potassium dichromate; with sodium hydrate of 1.21 sp. gr. it thickens, becomes straw yellow, and bluish violet on the surface after a long time. A writer in *Les Mondes* (Chem. News, 44, 1880, p. 216) states that the least trace of sesame oil is detected by the red color obtained on adding a little sugar to hydrochloric acid of 30° Baumé, and mixing with it an equal bulk of the oil; and for cotton-seed oil, equal volumes of the suspected oil and nitric acid of 40° are mixed; if this oil is present the mixture takes a coffee color. *I. Walz* (132) describes some reactions of a syrupy solution of antimony terchloride with olive and other oils; it gives with olive oil simply a whitish emulsion, soon becoming green, without any rise of temperature, while cotton-seed oil turns chocolate brown, with much evolution of heat, and soon solidifies. In a recent number of the *Druggist's Circular* it is stated that, when pure olive oil is heated to 250° C. in a test tube, it becomes paler in color, while most oils become darker; at the same time the odor of the heated olive oil is pleasant, resembling strawberries, while the odor of the other oils is repulsive. *Schneider* (121) detects rapeseed oil by mixing with the suspected oil a solution of 0.1 gram of silver nitrate in a few drops of water, to which are added 4 cc. of alcohol; a brownish red to a black color appears after an hour or two, in the lower stratum of the liquid, or sooner if much rape oil is present; Provence oil, poppy oil, sesame oil and ground-nut oil remain unchanged. *Dietzsch* (29) applies the same test for cotton-seed oil, with the addition of heating the mixture to boiling for 15 minutes.

D. Spectroscopic tests.—*Muller* (97) gives the absorption spectra of olive and sesame oil, but nothing that will answer for a test of adulteration of olive with sesame or any other oil. *Nickels* (102) gives a spectroscopic test for the presence of cotton-seed oil in olive oil by a difference in the absorption bands in the red; but *Macagno* (87) shows that the test is unreliable.

F. Miscellaneous methods for testing olive oil.—Of these the most important and valuable is *Maumené's* (89) which depends on the elevation of temperature suffered by a certain quantity of oil when concentrated sulphuric acid of 66° B. is slowly added to it from a burette with constant stirring with the thermometer, and, at the same time, on the difference in the behavior of different oils with regard to the evolution of sulphurous acid. Olive oil gives a smaller elevation of temperature than any other oil with which it is commonly adulterated, and gives off so little sulphurous acid that there is no effervescence.

Maumené took 50 grams of oil and added 10 cc. of sulphuric acid; olive oil gave 42° C. elevation of temperature, and other oils from 52° to 103° C. *Fehling* (42) confirms Maumené's statements in the main, but observes that the rise of temperature depends upon the rapidity with which the acid is added, the strength of the acid, and the size and thickness of walls of the beaker in which the test is made, and the initial temperature of oil and acid. To save the consumption of oil he took only 15 grams, and 5 cc. of acid; but he acknowledges that more concordant results are obtained with larger quantities. He obtained but 38° rise of temperature with olive oil, and correspondingly lower results for the other oils; he gives the results with several mixtures of olive with other oils, showing that a small admixture of some of these oils can be detected by the greater elevation of temperature that follows the application of the test. *Allen* (1) obtained results agreeing pretty closely with Maumené's, and exactly the same for olive oil.

Next to this in general importance is *Tomlinson's* cohesion-figure test (129). When a drop of a fixed oil is gently deposited on a perfectly clean surface of water, which can be obtained only in a dish which has been rinsed with concentrated sulphuric acid, or better with a solution of potassium dichromate in the acid, a certain combination of figures and movements results from the struggle between the cohesion of the oil and the adhesion between the oil and water, which is characteristic for each kind of oil; and when one oil is mixed with another the resultant set of cohesion figures betrays by its character the kind of oil in the mixture, and by the predominance of the figures belonging to one oil, shows the predominance of that oil. Practical men engaged in the oil trade could successfully use the method after a little instruction; and one of them remarked to Mr. Tomlinson, after observing the figures, that "the oils wrote their names on the surface of the water." *Hallwachs* (55) meets with good success in the use of this test, using common spring water at 15° C. and glass dishes 10 to 26 cm. in diameter; he describes the figures which he obtained. *Craf* (26) also recommends the method.

Mailho (88) detects oils containing sulphur, such as colza oil, by boiling the sample with sodium hydrate and testing the alkaline liquid for sulphur with lead acetate; or the test may be made more expeditiously by stirring the boiling mixture with a silver spoon. *Renard* (113) tests for ground-nut oil by separating out the arachinic acid by saponification, fractional precipitation and recrystallization, and finally identifying it by its high melting point; but for this purpose much pains must be taken to get the acid in a tolerably pure condition. The test is made more easily, as given in *Les Mondes* (see *Chem. News*, 44, 1881, p. 216) by simply dissolving the fatty acids, obtained by saponification of the suspected oil with alcoholic alkaline solution, removing the alcohol by evaporation to dryness and decomposing the soap by hydrochloric acid, in boiling alcohol; on cooling the acid crystallizes out. *Buignet* (19) proposes to detect adulterations of olive with other oils by measuring the refracting power of the oil. *Coleman* (25) describes a method of distinguishing fatty oils from one another by differences in the viscosity, but without making any practical application of the principle to the detection of adulteration of olive oil.

For *poisonous metals* the oil is tested by shaking it up thoroughly with dilute nitric acid, drawing off the aqueous liquid from beneath

the oil after it has settled, and examining the solution in the usual manner for metals. *Cailetet* (20) tests for copper by adding 10 cc. of oil to a solution of pyrogallie acid in ether and shaking the mixture thoroughly ; if copper is present the oil is colored brown, and cuprio pyrogallate is precipitated.

A multitude of ways are given for detecting adulterations of olive oil ; the lack is not in methods, but in respect to that assurance of the reliability of the methods which can come only from accumulated experience in the successful use of them by different analysts. Many of the reactions noticed in the preceding pages, especially the color reactions, depend for their manifestation on the presence of certain impurities associated with the glycerides in the crude oils, and which are more or less completely removed, as the oil is more or less carefully refined. Those who first describe the tests in many cases give us no information in regard to the quality of the oils used in establishing their tests ; therefore we do not know how much dependence can be placed on the tests if carefully refined oils are used as adulterants ; nor can we be sure that some of the reactions may not be given by poorly refined but unadulterated olive oil. Coleman in alluding to this feature of the subject shows that even refined oils of the same kind from different sources may give quite different color reactions. The simplest way to clear the path of all difficulties would be that which has been proposed in the case of milk, to declare that a good article of olive oil, fit for sale at good prices, shall stand certain tests.

The results of my own examination of olive oils.—I began with the test which has received the most testimony in its favor by analysts who have tried it, namely, Maumené's. My very first experiments gave results that enforced the importance of the careful regulation of the strength of the acid ; for with acid of 65° B., or only a degree lower than that given by the author, the elevation of temperature was not in any case as great as given even for genuine olive oil, although it differed much for the different samples. On bringing my laboratory acid, which thus happened to be below the standard, exactly up to 66° B. or 1.84 sp. gr. by the addition of Nordhausen acid, which at the time was the most expeditious way of attaining the desired end, very decided results were obtained ; but in every instance the rise of temperature exceeded 42°, sometimes by several degrees, even in the cases of oils which by most other tests applied appeared to be genuine olive oils.

I followed this test by others which seemed to promise to lead to some identification of the oils used in the adulteration that by the first test was quite clearly indicated in most of these samples ; I sought especially to identify poppy, sesame, ground-nut and cotton-seed oils.

I received sixteen samples of oil, with the following numbers and trade designations ; the price given is per 100 cubic centimetres. The numbers in black indicate samples that by my tests appeared to be genuine :

- 120. Huile d'Olive, superfine, clarifiée. Bordeaux.
- 121. Best Olive Oil.
- 224. Huile d'Olive, vierge. Nice. 6c.
- 225. Huile d'Olive des Gourmets, qualité extra fine. 15c.
- 226. Huile d'Olive, vierge d'Aix. 15c.
- 227. Huile d'Olive surfine, clarifiée double. Bordeaux. 8c.
- 228. Huile d'Olive, vierge. Nice. 7c.
- 229. Deutsches Extra S. Oel. Mohnoel. Sent by Inspector as olive oil. 15c.

230. Huile de Provence. 10c.
 231. Huile d'Olive, surfine, deux fois clarifiée. 5c.
 232. Huile d'Olive vierge d'Aix. Bordeaux. 5c.
 247. Superfine Lucca Olive Oil. Leghorn. 16c.
 248. Huile d'Olive vierge d'Aix. Bordeaux. 12c.
 249. Huile d'Olive, surfine clarifiée. Bordeaux. 9c.
 250. Huile d'Olive, vierge d'Aix. Bordeaux. 17c.
 251. Huile d'Olive, surfine, doublement clarifiée. 17c.
 3101. Huile d'Olive, vierge d'Aix. Bordeaux.

The results of my examination are set forth in the following table.

No. of Sample.	I. FOR ADULTERATION IN GENERAL.	II. FOR COTTON SEED OIL.	III. FOR POPPY, GROUND NUT AND SESAME.
	To 15 gr. oil in small beaker, lower part jacketed with flannel, added dropwise 5 cc sulphuric acid 66 deg. Baumé, while stirring with a thermometer. Noted rise of temperature and evolution of sulphurous acid.	To 1 volume of oil added 1 volume nitric acid 40 deg. Baumé, mixed and let stand. Noted color taken by the oil.	To 5 volumes of oil added 1 volume nitric acid sp. gr. 1.33, mixed by shaking, and let stand. Noted, color of upper stratum or oil.
120..	From 15 deg. to 55 deg., no effervescence with sulphurous acid.....	None.....	Light green.
121....	From 26 deg. to 85 deg. and upwards. Much sulphurous acid.....	Coffee, lighter shade.....	Very red.
224....	From 25 deg. to 95 deg. and upwards, abundant evolution of sulphurous acid, with effervescence.....	Coffee, dark shade.....	Reddish.
225..	From 24 deg. to 73 deg., no effervescence.....	None.....	Light green, reddish tinge.
226..	From 20 deg. to 63 deg., very little sulphurous acid.....	None.....	Light green.
227....	From 25 deg. to 95 deg. and upwards, very abundant effervescence with sulphurous acid..	Coffee, col. rather light...	Reddish.
228....	From 24 deg. to 95 deg. and upwards, very abundant evolution of sulphurous acid.....	Coffee, col. dark shade....	Faint reddish.
229....	From 25 deg. to 95 deg. and upwards, and much effervescence.....	Coffee, col. light.....	Quite reddish.
230....	From 22.5 deg. to 90 deg. and above, some sulphurous acid.....	Coffee, col. dark shade....	Faint reddish.
231....	From 24.5 deg. to 95 deg. and upwards, very abundant effervescence with sulphurous acid.....	Coffee, col. rather light...	Red.
232....	From 21.5 deg. to 95 deg. and upwards, abundant evolution of sulphurous acid.....	Coffee, col. dark.....	Reddish.
247..	From 25.5 deg. to 71 deg., no effervescence.....	No change.....	Light green.
248....	From 26 deg. to 95 deg. and upwards, most abundant effervescence of sulphurous acid. Repeated: same result.	Coffee, col. rather light...	Red.
249....	From 21.5 deg. to 100 deg. and upwards, abundant effervescence, with sulphurous acid.....	Coffee, col. dark.....	Reddish.
250..	From 24 deg. to 89 deg. and little sulphurous acid.....	No change.....	Clear greenish, very light.
251..	From 24.5 deg. to 73 deg., little effervescence.....	No change.....	Light green.
3101	From 15 deg. to 60 deg., and no effervescence...	No change.....	.....
120..	Repeated: 26 deg. to 72 deg., no effervescence..	.....	.....

NO. OF SAMPLE.	IV. FOR POPPY, GROUND NUT AND SESAME.	V. FOR POPPY OIL.	VI. FOR SESAME OIL.
	<p>To the 6 volumes of the preceding test, added 10 volumes solution sodium hydrate, mixed by shaking, and let stand.</p> <p>Noted—Color of upper stratum, and of liquid beneath.</p>	<p>To 5 volumes of the oil, added 1 volume of mixture of concentrated nitric and muriatic acids, and then 10 volumes of sodium hydrate.</p> <p>Noted—Color of upper stratum, and of liquid beneath.</p>	<p>To 1 volume of the oil, added 1 volume of a mixture of equal parts of sulphuric and nitric acids, both concentrated, mixed, and let stand.</p> <p>Noted—Color of upper stratum immediately, and then later.</p>
120..	Upper, yellowish white.	Upper, rose color. Lower, no color	First, yellowish. Later, deep red.
121 ..	Lower, no color.	Upper, orange brown.	First, deep green, boiled over.
224....	Upper, reddish brown. Lower, very brown.	Lower, orange brown.	First, nothing decided. Later, almost black.
225..	Upper, reddish. Lower, reddish.	Upper, faint red. Lower, no color	First, little change. Later, deep red, thin transparent greenish layer at very top.
226..	Upper, greenish. Lower, greenish.	Upper, brownish. Lower, brownish.	
226..	Upper, greenish white. Lower, no color.	Upper, faint pink. Lower, no color.	Same as above.
227 ..	Upper, pink. Lower, no color	Upper, faint pinkish. Lower, no color.	Same as 224.
228....	Upper, faint pink. Lower, no color.	Upper, pink fibrous matter separating. Lower, colorless	Same as 224.
229 ..	Upper, brownish. Lower, brownish.	Upper, bright rose. Lower	Same as 224.
230 ..	Upper, faint pink. Lower, no color.	Upper, fibrous pink particles separating out. Lower, colorless.	Same as 224.
231....		Upper, pinkish. Lower, colorless.	Same as 224.
232 ..	Upper, pink fibrous, streaks more solid. Lower, colorless.	Upper, with pink fibrous matter more solid. Lower, colorless.	Same as 224.
247..	Upper, reddish. Lower, reddish.	Upper, brownish. Lower, colorless.	Same as 225.
248....	Upper, pink. Lower, no color	Upper, fibrous, more solid particles floating. Lower, colorless.	Same as 224.
249....	Upper, pink. Lower, no color	Same as above.	Same as 224.
250..	Upper, greenish. Lower, no color.	Upper, pinkish. Lower, no color.	Same as 120.
251..		Upper, brownish. Lower, colorless.	Same as 225.
3101			
NO. OF SAMPLE.	VII. FOR GROUND NUT OIL.	VIII. FOR COTTON AND RAPE OIL.	IX. Condition of the oils on standing over night in room at about 3 deg. C.
	<p>The oil saponified, soap decomposed by acid, and the fatty acids dissolved in boiling alcohol, and solution cooled.</p> <p>Noted—Whether crystallization of fatty acid took place.</p>	<p>The oil was mixed with a solution of silver nitrate, containing alcohol, and boiled.</p> <p>Noted—Whether oil and liquid beneath colored brown.</p>	
120..	To small extent	No color.	Clear.
121....	To small extent	No color.	Some deposit.
224....	Very much	Somewhat colored.	Very much deposited, occupying nearly the whole volume of oil.
225..	To small extent.	No color.	Much deposited.
226 ..	To small extent	No color.	Very heavy deposit.
227 ..	Very much indeed	Considerably colored.	Turbid throughout, fine deposit, not crystallized as others.
228 ..	Very much.	Much colored.	Very little deposit.
229 ..	To small extent	Somewhat colored.	Clear.
230 ..	Very large deposit.	Much colored.	Fine deposit throughout the liquid.
231....	Very large deposit.	Somewhat colored.	Clear.
232 ..	Very much.	Very much colored.	Little deposit.
247..	To very small extent	No color.	Very much deposit.
248 ..	Very large deposit.	Very dark color indeed.	Clear.
249 ..	To small extent.	Much colored.	Much deposit.
250..	None	No color.	Very little deposit.
251..	To very small extent.	No color.	Very little.
3101.		No color.	

Conclusions.—The first and most prominent result obtained is that a majority of the oils tested are undoubtedly adulterated. The only oils that stood the first test (Maumeneé's) were Nos. 120, 225, 226, 247, 250, 251 and 3101, and in the tests that followed these oils behaved in most cases quite as described for pure olive oil, or else gave no clear reaction for any adulteration. These were in all cases the higher priced oils and those which appeared to be most adulterated were, with the singular and single exception of No. 229, which was labeled Mohnöl, cheap oils. Tests II and VIII taken together appear to indicate very plainly, by the deep brown color of the reaction, that Nos. 228, 230, 232 and 249 were adulterated with cotton-seed oil. Tests III, IV and VI gave most decided proof of sesame oil in No. 121, a sample procured by Mr. Colby, of a first-class druggists' firm in the city, at my request for a specimen of genuine oil for a standard of comparison. Instead of getting my standard of purity in that way, I have been obliged to select it from the whole number sent me, on cumulative evidence furnished by a variety of tests. No. 120, from the same firm, proved to be a genuine oil; this sample was sold in the original bottle, with foreign label, while the other, with only the label of the New York firm, appeared to be a sample of oil bought in bulk. The dark red or brown colors obtained in tests III, IV and V, gave strong indications of the presence of adulterating oils in most of the samples which did not stand the first test with concentrated sulphuric acid. Test V gave evidence of poppy oil in No. 229, by the bright rose color of the upper layer; on transcribing the trade labels on the bottles for the list of samples, p. 540), sometime after these tests were made, I found that this was labeled Mohnöl (poppy oil). According to Inspector Colby's label on the other side of the bottle, which was the only label that I examined, for the inspector's number when testing the oils, it was a sample of olive oil, and was sold to him as such; I had decided that it contained poppy oil, although supposing, till long afterwards, that it was claimed to be olive oil. From tests VII, Nos. 224, 227, 228, 230, 231, 232 and 248 appear to contain ground nut or pea nut oil; and as 228, 230 and 232 have already been noted as giving two characteristic reactions for cotton-seed oil, it must be concluded that both oils may be present. Test IX seems to show that if the indications of previous tests can be trusted, the behavior of the oil at low temperature has little value as a mark of purity; for the oils which by all other tests appear to be genuine, behave quite differently; and the presence of foreign oils, as indicated by previous tests, increases instead of diminishes the extent to which the oil solidifies. No. 229, however, the poppy oil, was found at a subsequent time to be quite clear at temperatures much below 3° C., which accords with the properties of the oil given in the books.

To sum up the whole matter, while there may not be in the results of these tests positive proof of the presence of this or that foreign oil in particular, there is fully sufficient proof of adulteration of some kind; and nothing more is required to convince me of the presence of *sesame* oil in 121, and little more is required to satisfy me as to the presence of *cotton-seed* oil in Nos. 228, 230, 232 and 249, of *ground-nut* oil in 227 and 231, and of one or both in 224 and 248.

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GROUP III.

CANNED MEATS AND ANIMAL FOODS: MEATS—FRESH, SMOKED, SALTED, CANNED; EXTRACTS AND ESSENCES OF MEAT AND FISH; GELATIN AND ISINGLASS.

BY ALBERT H. CHESTER, PH. D.

Prof. C. F. CHANDLER, Ph. D.,

Chairman Sanitary Committee :

My Dear Sir:—I take pleasure in submitting to you herewith my report, as one of the chemists under the Food and Drug Act, on Canned Meats and Animal Foods.

Yours very respectfully,

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HAMILTON COLLEGE,
CLINTON, N. Y., Dec. 3, 1881.

The use of animal food is so closely connected with physical force that it is a matter of vital importance to the welfare of any nation that its people should be supplied with cheap and wholesome meat. There can be no question that the physical superiority of the English over Continental nations is due in great part to the roast beef and mutton that have been so freely consumed in Great Britain. While life may be sustained and much work accomplished without any animal food at all, yet it is an acknowledged fact that severe bodily exertion cannot be sustained without it. This is recognized in the difference made in the diet of prisoners, depending on whether they are at hard labor or not. It is found that while milk, butter and cheese will be great additions to an otherwise purely vegetable diet, meat is the great work-producing agent. We are very fortunate here in this respect, and the poorest of our people can have meat every day of their lives and still a surplus be left to be sent abroad to feed people who would otherwise have to do without it. American lard, pork, and hams are supplied in all the European markets, and beef from this country is used to a large extent in Great Britain, all being sold cheaper than the home products. The great value of our exports of this class of food to some of the countries of Europe is shown by the following extract from a speech of M. Graux, the Belgian Minister of Finance. He is arguing against the imposition of a duty on meat preserves, and says:

"To stop these importations would be to devote the working classes (of Belgium) to misery, if not to death; to obstruct their entry by means of customs-duties would be to impose on the masses prices which would only benefit the land-owners. It is thus that some amongst us, in order to protect the agricultural interests of the country and prevent the owners of agricultural lands from suffering that reduction of their rents which the common and universal law of supply and demand imposes, would have us, by stopping these importations, make a compact with famine and deliver our industrial and laboring classes to misery, decline and ruin."

Fresh meat is, undoubtedly, the most important and valuable kind of animal food, as either salting or smoking it makes it less easily digestible. It is important that the animals should be properly killed, and the blood allowed to escape afterwards, and that the meat should be delivered to the customers in a sound condition; though meat is always better if it has been kept awhile before it is cooked, even nearly to the point of decomposition. The fibre of such meat is loose and tender and much more digestible. The best meat is from animals that have been fattened before being killed. The muscle of unfattened cattle contains about seventy-five per cent of water, with only two or three per cent of fat, while the flesh of fat cattle is marbled and streaked with fat which has to a certain extent taken the place of the water, and hence is much more valuable as food.

Sound healthy meat can be recognized by its pale reddish color when first cut, the surface afterwards turning to a deep red color. The meat of animals that have died is of a deep purple color, not having been bled. Such meat often has an unpleasant odor, which healthy meat has not until it begins to decompose. Putrid meat may often be recognized by its odor, or by thrusting a knife into it. In healthy meat the resistance to the knife will be uniform while it will vary if it has begun to putrify within. The smell of the knife often affords useful information. There is not much danger from this kind of meat, for the customer himself will detect and refuse it. It is not so however with certain diseases of the flesh, and the infection caused by parasites, which can only be detected by the use of the microscope, and public inspectors must be very vigilant to protect the people. This matter is one of great importance in cities, and is generally carefully looked after by local Boards of Health. The most common and dangerous of these affections is the presence of trichinæ in pork.

TRICHINÆ.

The vast importance of the production of pork for home consumption and for export makes it desirable to give more than a passing glance at this part of the subject. Pigs are so easily fattened and the pork is so readily cured and preserved that it will always be one of the chief products of certain parts of the country. And it is no doubt a most useful food particularly for the mass of working people and in the winter. Many people hardly see fresh meat the year around, but consume great quantities of salt pork and smoked ham. Our exports of such food material is immense and constantly increasing. It is so cheap here that it can be sent to European markets and compete with their home products, so that the German peasant is to-day buying American pork and hams. But the fear that these American products may contain the pork worm, *Trichina spiralis*, is causing many of the European states to pass stringent regulations with reference to the admission of our products of this character, even including lard, in which certainly trichinæ cannot be found. Thus great damage is being done to our export trade. That this fear is not unfounded is too evident from the examinations made in Chicago by Mr. Attwood, who found trichinæ in eight per cent of the hogs killed in that city. There have been many cases of the disease, trichinosis, often ending in death, as the result of eating such meat. We have then two evils to guard against, the danger to ourselves if trichinous meat is used, and the damage to our trade

abroad if we do not suppress the exportation of such meat. Consul Byers thus writes to the State Department from Zurich, Switzerland, showing the condition of things in that country. "There exists a Government order dated May 17, 1878, forbidding the importation of hams, bacon, etc., whether from America or elsewhere, unless said importation is accompanied by a certificate showing that the meat is 'healthy'. If no such certificate is presented, the meat must be submitted to a microscopic examination for 'trichinosis'. This certificate is charged for at the rate of about 25 cents a ham. The practice has been to be especially severe in the execution of this order as to American hams, as certain interested parties have frightened the population into the belief that eating American hams is simply to court death. The result is that American hams can scarcely be sold here at all, or if sold the dreaded word 'American' is left off, and the meat is offered as coming from Germany."

Privy Councillor Ruloff in a recent lecture before the National Health Association, at Berlin, spoke as follows: "It is well-known that trichina is of frequent occurrence in America, therefore sausage, bacon and hams produced there must be considered as very dangerous. Inspections at various points show that from one to four per cent of these preserves contain trichinae. As may be easily foreseen, trichinae will increase in America unless steps are taken to prevent it."

We must therefore adopt measures to prevent the exportation of any such meat, and to prevent the further spread of the disease in the hogs raised in this country, if not to root it out altogether. For the first result it will probably be necessary to have every lot of bacon and ham, packed for shipment abroad, inspected for trichinae by officers appointed for the purpose, their certificates to be sent with the articles. Consul Byers is of the opinion that such certificates would be respected all over Europe, and that much of the prejudice now existing would be removed. For ourselves in this country, the danger is not so great, for we seldom eat our meat raw, as is so frequently the case abroad. And yet none of us wish to take the chances of trichinous meat even though we know it to be well cooked. Thorough cooking will certainly kill trichinae, and we may rest easy as to danger from that source, if we only see to it that all the pork we eat has in all its parts been subjected to a temperature of at least 160 deg. Fahrenheit. It should be well understood that pork should never be eaten raw unless it has been carefully examined, and that the cooking must be thorough, and not a mere warming of the surface, if the probable trichinae are to be killed. It is to be noticed that this parasite is seldom found in the home grown pigs generally eaten in the county. I have never found any in the ham and pork offered for sale in this village. It is in the large fattening establishments where meat is produced in immense quantities for sale in cities and for export, that it is most often found.

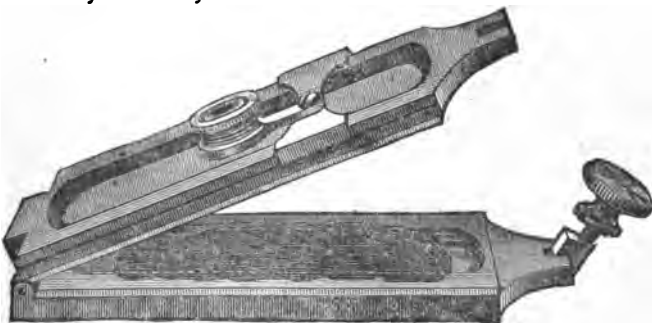
Before looking for the means of protection from this pest, let us see how it is to be detected. The *Trichina spiralis* is a minute worm found coiled up in animal muscle, particularly in the flesh of swine, not, however, to be certainly distinguished by the naked eye, though such pork often has a speckled appearance. An examination with the microscope is necessary to reveal it in its coiled up form. The worm itself is enclosed in a little sac or cyst covered with a calcareous

deposit, which effectually prevents further motion, although the inmate is still alive.



The above figure, taken from Dr. John Phin's little pamphlet on trichinæ shows the appearance of the worms in the encysted form. When meat is eaten containing these encysted worms, the gastric juice dissolves the coating of lime, and the worm is set free to roam at will through the muscles of his entertainer, be it man or beast, and to reproduce his own kind in myriads. They cause sickness and death if in sufficient numbers, but if this result is not reached, they soon become encysted in their new home, after which they are powerless for harm.

A magnifying power of about fifteen diameters will easily serve for their detection, and the best instrument is of course the compound microscope in the hands of an expert; yet this is not necessary, for I have seen them distinctly with an ordinary hand magnifier having a power of only nine diameters. The best simple instrument that I have seen for this purpose, is the one figured in the cut below, called a trichinoscope, and recently devised by the Bausch & Lomb Optical Co., of Rochester. It is so easily used that no one of ordinary intelligence could have any difficulty with it.



Two glass slips are held in hinged frames with a screw clamp at one end, so that they can be brought together and pressure applied to any object placed between them. A good doublet, magnifying about fifteen diameters, is so arranged that it can be accurately focussed, and it is movable over the whole surface of the glass. The thin slice of flesh to be tested is if possible soaked in acetic acid for a few minutes, though this is not absolutely necessary, and then spread out on one of the slips of glass. The other is brought down on it and clamped fast, enough pressure being applied to make the flesh transparent. The magnifier has then only to be adjusted when it will be easy to find trichinæ if present. They are more apt to be found in certain muscles than in others, and if the whole animal can be examined the diaphragm is the muscle to choose, or those of the head and throat. The muscles around the eye often show them, and I have heard it stated by a prominent microscopist that he never examined any cat's eyelid in which he did not find them. In testing a ham a thin shaving from the small end as near the tendon as possible should be taken. With one of these instruments, which costs but a trifle, it is easy for any one to detect trichinæ, and every butcher may examine the pigs he buys if he wishes. And if a fine is imposed on every one detected in selling trichinous meat, the butcher will want to be able to detect it, and so protect himself. The law should be stringent on this point, and should specially define this kind of material as dangerous to the public health. Such a law well enforced, would by degrees root out the evil, and our fattening establishments would be so arranged that healthy animals could not become infected. This is a most important point and should be guarded against very carefully. In the large establishments, and the smaller ones, too, the offal is much of it fed to the pigs so that if the disease once makes a beginning it is carried on from one set of pigs to another as fast as they arrive. The remedy is to keep such material in iron boxes safe from cats and rats and to cook it thoroughly before it is used for any purpose, either for feeding pigs or for the manufacture of fertilizers. If every one who sells trichinous meat is liable to be fined, the means for destroying the pest will be sought by every one interested, and the final result will be its entire destruction.

MEAT EXTRACTS.

Since the discovery by Baron Liebig, in 1857, of the extract which bears his name, a great number of such preparations have been put on the market mainly for the use of invalids, their value depending on how nearly they approach the original in composition. Extract of meat, when properly made, consists of those constituents of flesh which are soluble in hot water; the solution having been evaporated as much as possible for convenience in transportation. These soluble parts of meat include a number of obscure chemical substances, the value of which have not been accurately ascertained, and certain salts also found in the meat. The proteids, such as albumen and fibrin are left out, not being soluble in hot water, and if the extract is well made the fat is entirely separated having a tendency to turn rancid. The gelatine is also excluded as a useless incumbrance carrying water and so diluting the product.

The materials composing the extract are not food in the ordinary sense and ought never to be allowed to take its place, as is insisted upon

by Liebig in all his articles on the subject. It is useful both as a nerve stimulant, and as an adjunct to food proper. There are too many recorded cases of its usefulness in the first respect for any candid person to doubt it. It takes the place of alcoholic stimulant, and is often used in cases of extreme nervous exhaustion and prostration. It is of great value in the sick-room in cases of fever when true food cannot be given and it is necessary to stimulate the vital forces. It is really nothing more or less than a concentrated form of the best beef tea and no one doubts the value of that. Yet there is a popular impression that ordinary beef tea is food, and many invalids are starved upon it when they ought to be nourished. Let it be distinctly understood that beef extract, and equally beef tea, is not food if used alone. It is only a stimulant, and resembles tea and coffee in its effects. The nourishing parts of the meat have all been left out, and always will be when it is made with hot water. If beef juice is to be used as nourishment rather than stimulant it should be extracted with cold water, the addition of a few drops of chlorhydric acid aiding much in the operation. Beef extracts contain part of the valuable constituents of the meat. If the muscle-producing parts were added you would then have true meat food. It is found however that these constituents, the albuminoids, can be added in the form of vegetable products, while the extractive matters can only be obtained from meat. This is Liebig's claim and it seems to be borne out by all the facts. His belief was strong that the most valuable part of the meat is the extractive matter since it cannot be obtained from any other source, hence his formula aims to leave out everything else. It is said by some however, that an extract would be more valuable if it contained in addition the other parts of the meat and was in fact condensed meat. It is therefore claimed for some of the extracts sold that they contain all the valuable constituents of meat in a concentrated form and are therefore true food, consequently of far greater value than Liebig's Extract, much greater in fact than the amount of meat they are said to represent. I have tested a number of these extracts with the results given below.

No. 1. Liebig's Extract.

It is packed in a small earthen jar containing about 50 grams of a brown paste and costs 50 cents.

Water.....	18.27	per cent.
Organic matter.....	58.48	"
Ash.....	23.25	"
Soluble albumen.....	0.05	"
Alcoholic extract.....	44.11	"

No. 2. Berger's Extract of Beef.

Package, or tin can containing 58 grams of a yellowish jelly, quite stiff. Price 28 cents.

Water.....	40.65	per cent.
Organic matter.....	39.85	"
Ash.....	19.50	"
Soluble albumen.....	1.11	"
Alcoholic extract.....	13.18	"

No. 3. Starr's Extract of Beef.

Package, a tin can containing 130 grams of extract quite similar to No. 2. Price 60 cents.

Water.....	37.00	per cent.
Organic matter.....	55.65	"
Ash.....	7.35	"
Soluble albumen.....	1.10	"
Alcoholic extract.....	10.13	"

No. 4. Johnston's Fluid Beef.

Package, a tin can containing 60 grams of a stiff yellow paste. Price 35 cents.

Water.....	41.20	per cent.
Organic matter.....	50.40	"
Ash.....	8.40	"
Soluble albumen.....	1.17	"
Alcoholic extract.....	15.93	"

No. 5. Guant's Beef Peptone.

Package, a corked bottle containing about 105 grams of a molasses-like substance. Price 50 cents.

Water.....	37.15	per cent.
Organic matter.....	54.92	"
Ash.....	7.93	"
Soluble albumen.....	0.00	"
Alcoholic extract.....	20.16	"

No. 6. Valentine's Meat Juice.

Package, a corked bottle containing 83 grams of a thin dark colored fluid. Price 75 cents.

Water.....	54.40	"
Organic matter.....	31.85	"
Ash.....	13.75	"
Soluble albumen.....	0.44	"
Alcoholic extract.....	26.32	"

No. 7. London Co.'s Extract of Beef.

Package, a tin-can containing about 50 grams of a thin honey colored extract. Price 30 cents.

Water.....	81.90	per cent.
Organic matter.....	16.80	"
Ash.....	1.30	"

No. 8. London Co.'s Essence of Mutton.

Package, same as last but containing 60 grams extract. Price 50 cents.

Water.....	78.00	per cent.
Organic matter.....	19.50	"
Ash.....	2.50	"

No. 9. London Co.'s Essence of Chicken.

Package, same as last but twice as large, containing 112 grams of extract. Price 75 cents.

Water.....	71.60 per cent.
Organic matter.....	27.10 "
Ash.....	1.30 "

Putting the above figures into a tabulated form for convenience of reference we have the following.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
Water... ..	18.27	40.65	37.00	41.20	37.15	54.40	81.90	78.00	71.60
Organic matter.....	58.48	39.85	55.65	50.40	54.92	31.85	16.80	19.50	27.10
Ash.....	23.25	19.50	7.35	8.40	7.93	13.75	1.30	2.50	1.30
Soluble albumin....	0.05	1.11	1.10	1.17	0.00	0.44	.....	.....	.....
Alcoholic extract....	44.11	13.18	10.13	15.93	20.16	26.32	.....	.....	.....

The albumen was determined by treating the extract with tepid water, the solution obtained being heated in a water bath for some time with the addition of a few drops of acetic acid. Numbers 2 and 3 contain a large amount of gelatine. Number 4 contains a considerable amount of meat fibre in a very finely divided condition. Numbers 7, 8 and 9 are evidently just what they claim to be, extracts in hot water, much less concentrated than the others, and containing nothing to preserve them. They therefore spoil soon after being opened and exposed to the air. The percentage of the extracts taken up by strong alcohol, is I think the most important matter in the examination, and it is here that the poorer extracts will be found to fail.

From these analyses it will be seen that the principal difference between them is the amount of water that they contain, and in some cases there is a large amount of gelatine, useful in making soup, but not considered of great value as food. It is evident that the claim of making an extract equal in all respects to fresh meat has not been carried out, and to use any of them as the sole food of an invalid would be a great mistake.

I do not find any evidence of adulteration in the extracts examined, unless the presence of gelatine, and an undue amount of water can be so considered; but I do find that the claims of the makers on their labels are not substantiated, and I am forced to believe that there is no extract in which soluble albuminous substances are found to any extent.

Besides the various extracts of meat, there are in the market many extracts of fish some of which are of considerable value. They are of the same character as meat extracts, according to Dr. Letheby, but not so pleasant in taste or of as great value. I have not been able to obtain any of them for examination.

As has been stated Liebig insisted that while this extract is not in itself food it is an essential ingredient of food, obtainable from no other source, and if mixed with albuminous and starchy matter, will give the best food at a cheap rate. Acting on this suggestion various forms of meat biscuits have been prepared, and a very concentrated form of

nourishment is thus obtained, useful in circumstances where fresh meat cannot be had, as in Arctic voyages. While the absurd claims of the manufacturers of such material cannot be substantiated, these preparations are, to say the least, of considerable value, and would be more used if their merits were better known. In most cases, however, it will be cheaper and more convenient to carry the extract by itself and eat it with bread or mix it in soup as wanted.

MEAT PRESERVES.

There are three principal methods of preserving meat, by salting, smoking and canning. The first two methods do not add any thing of a dangerous character to the meat, neither do they efficiently destroy any danger that may be hidden in it. Meat, unwholesome before, will not be wholesome after such treatment. *Trichinæ* will not be killed, and it is in meat so prepared that we will most often find this pest. But in canning meat there is the added chance that poisonous metallic impurities may get in by accident as well as that other substances may be put in by design as adulterations. All kinds of meat are now put up in tin cans for preservation and easy transportation, so that we may buy in our own market beef from South America, buffalo tongues from the Western prairies and Kangaroo tails from Australia.

The packages most likely to be adulterated are the expensive potted and spiced meats and fish used generally as relishes. In these, as Dr. Hassall tells us, may often be found flour, chalk, plaster of Paris, Venetian red, and Armenian bole, a sort of red clay. But these matters do not concern the public to any great extent, and I have confined my attention to those canned meats that are largely used as food in this country. Among these we find canned beef, mutton, ham, tongue, turkey, chicken and corned beef, the last more used than all the rest together. These materials are very extensively prepared and packed and are used by people who can not readily obtain fresh meat. Many cases have been reported in the papers where it is alleged that persons have been poisoned by the use of such meat. I have never been able to obtain a sample of the meat which had produced such a result, nor have I seen any authentic report of a chemical examination of such meat, showing the kind of poison. It has been said that lead from the solder is liable to be found in the meat, and sometimes this may be the case, although I do not believe the danger from this source to be great. To meet this difficulty some manufacturers do not use lead solder at all. There is more danger when the cans are made of tinned plate, containing lead, instead of pure tin plate. Tinned plate should never be used in canning goods for use as food, for the lead is very liable to get into the food. If good tin-plate free from lead is used, and the soldering is properly done no one need fear lead poisoning from this source, although so much has been said about it that many people are afraid to use eatables of any kind put up in tin. Recently another view of the subject has been promulgated by Mr. Otto Heyner, of London, who says that nearly all canned meats and vegetables dissolve tin from the cans and are dangerous to use in consequence. He says that tin in the stannous form as it will be if so dissolved is a "virulent irritant poison," proving this statement by citing experiments conducted by himself on some Guinea pigs and concluding his report as follows:

"I trust that the medical profession will object, unmistakably and strongly, to the administration of tin by grocers and oilmen to young and old alike, and, whilst acknowledging the enormous benefits conferred upon the masses by the introduction of preserved foods, will insist that the present system of packing be speedily abandoned." This is a very sweeping denunciation of tin cans, and if his statements are correct we must condemn all tinned goods as dangerous, and prohibited under the act to prevent the adulteration of food and drugs. There is one fact however that will make it difficult to believe these assertions, at least as far as goods packed for sale in our own country are concerned. Many people in the west, particularly in mining and lumber camps, eat food so preserved every day of their lives, and do not suffer in consequence. In my own experience I have had gangs of men at work in the woods for months at a time eating canned corned beef, tomatoes, corn, peaches and condensed milk every day without a single case of sickness of any kind during the season. If there is always tin in such food it cannot be a very "virulent" poison.

Glass is a safer material for cans, and the method recently patented by Mr. Edison for preserving perishable articles of food in glass vessels promises good results, as there is no chance for contamination of any kind. But the great objection to this method is the danger of breakage which will prevent it from ever taking the place of tin completely. That packages of beef will keep well when properly put up is shown by the following fact. In the summer of 1875, while going with a party through the woods of Northern Minnesota, some cans of corned beef were hidden under a stump, to be used on our return. We came back by another route, and did not use it at that time. Though some of us passed that way afterward it was not again thought of until the summer of 1880 when it was sought and found just as it had been left. The cans were opened and the meat eaten, being perfectly sweet and good, though exposed to the alternations of a Minnesota climate for five successive summers and winters. Glass cans would probably have been broken by freezing the first winter.

The worst thing that can be said about these canned goods is that the quality of the meat is not the best, perhaps sometimes not even good. The scraps and bits that formerly went into the manufacture of fertilizers are undoubtedly often used up in this way, and the canned meat therefore represents the very poorest parts of the animals. In the case of beef there may be no great objection to this, for the meat is thoroughly cooked and always sufficiently tender. Canned ham and pork should however be always carefully looked over for trichinæ, which are most often found in the poor parts that would probably be selected for canning. Spoiled and putrid meat could hardly be used for this purpose without detection, and I have only seen one instance of it in any of the cans that I have examined, and this was indicated before opening the can by its bulged appearance. I could not tell of course whether it was tainted meat to begin with, or had spoiled after canning through some defect in the process. I found no metallic poisons in any of the canned meats examined.

ISINGLASS AND GELATINE.

These similar animal preparations are used extensively in the manufacture of jellies and soups, and in clarifying liquors. Isinglass is made from the swimming bladders of fish, while gelatine is prepared from the skin and bones of animals. They are identical in composition and uses, but the isinglass is decidedly the finer and more expensive product and therefore gelatine is often substituted for it in whole or in part. Isinglass is more soluble in water than gelatine and makes a clearer and better jelly, and is said not to be so apt to disagree with the delicate stomach of an invalid. It has a slightly fishy smell though not an unpleasant one, while gelatine has more or less the smell of glue. The four samples I was able to obtain in market here were two of them sold for isinglass and two for gelatine, but all turned out to be samples of gelatine, those sold as such being of better quality and rather more expensive than those called isinglass. There is a decided lack of knowledge with respect to these materials in this country. The English are better posted, and would not buy common gelatine smelling like glue when warmed in water, under the name of isinglass. It would be well to have this adulteration or substitution distinctly specified as against the law. The gelatines examined were found to be of very good quality and free from adulterations.

HAMILTON COLLEGE LABORATORY,
December 3, 1881.

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GROUP IV.

CEREALS, AND THE PRODUCTS AND ACCESSORIES OF FLOUR AND BREAD FOODS; WHEAT; RYE; BARLEY; RICE; OAT-MEAL; CORN-MEAL; SAGO; TAPIOCA; AND LEGUMINOUS PREPARATIONS; SPECIAL ARTIFICIAL FOODS FOR INFANTS AND INVALIDS; BAKING POWDERS; CREAM TARTARS; BICARBONATE OF SODA; BICARBONATE OF AMMONIA; ALUM POWDERS AND THE "ALUM QUESTION".

By, E. G. LOVE, Ph. D.

NEW YORK, *December 31, 1881.*

Prof. C. F. CHANDLER,

Chairman Sanitary Committee State Board of Health :

SIR— I have the honor to submit the following report on the group of foods assigned to me for examination. It includes the cereals and their products, flour, bread, baking powder, etc. I have examined in all 283 samples, of which thirty-seven only were adulterated.

Very respectfully,

E. G. LOVE, PH. D.

In the following report I have endeavored to present, in as concise a manner as possible, the results of my examination of the samples submitted to me. These examinations, having for their specified object the collecting of information concerning the extent to which food and drug adulteration is practiced in this State, and moreover as the time allowed for the investigation was necessarily limited, those articles of food of this group were first examined which were considered most likely to be adulterated, and the many interesting questions which presented themselves during the work were made of secondary importance. For this reason the subject of "Infant Foods" is not considered in the following pages. Previous examinations had proved to my own satisfaction that they were not subject to adulteration, and the question of their dietetic value, while of great importance, was considered somewhat foreign to the present investigation. I should have included them, however, had there been sufficient time.

As to methods of examination, the microscope was mainly depended upon for the detection of foreign matter of a purely vegetable nature, while for the inorganic adulterants the simple methods of the laboratory were employed.

I have considered the "alum question" at some length, inasmuch as the very general use of alum baking powders in this country made it desirable to ascertain the prevalent opinion of chemists and physiologists regarding the wholesomeness of such preparations.

BAKERS' CHEMICALS.

Saleratus.— The term saleratus was originally applied to bicarbonate of potash and previous to the introduction of baking powders was in common use in the kitchen. Its greater cost however has led to the substitution for it of the much cheaper compound bicarbonate of

soda, and at present none of the saleratus sold by grocers contains the potash salt. This substitution cannot, however, be considered as an adulteration, inasmuch as there is nothing necessarily restricting the name saleratus to the bicarbonate of potash, and so long as the commercial article is sold at the price of the soda compound there is no evidence of intention to defraud.

I have examined twenty samples of saleratus submitted to me, and in every case they consisted of bicarbonate of soda without foreign matter other than that always found in the commercial article. The samples were put up and sold in paper packages, and in most cases were marked with the manufacturer's name. The sale of such articles in bulk and with no name attached is always objectionable as offering greater facilities for adulteration.

Baking Soda.—This is the commercial bicarbonate of soda, which as such is employed in cooking, and also forms one of the active ingredients of baking powder. Of the twenty-three samples examined only three were adulterated. One with terra alba or ground gypsum, to the extent of about twenty-five per cent; another with about the same amount of gypsum in addition to a small quantity of starch; and the third with a large amount of sulphate of soda and about seventeen per cent. of carbonate of lime. On account of its cheapness there is little temptation to adulterate baking soda. It should be remarked that every commercial bicarbonate of soda contains small amounts of the sulphate and chloride of sodium as impurity in its manufacture. As these impurities are in no way injurious, in the small quantity in which they exist, and as a chemically pure article would be expensive, no special objection can be raised to their presence. It is interesting, however, to know to what extent these impurities exist, and the following table gives the results of some analyses to ascertain the amount of sulphate of soda present in common baking soda.

1.	Percentage of anhydrous sulphate of soda.....	2.22
2.	“ “ “	1.22
3.	“ “ “	1.92
4.	“ “ “	0.98
5.	“ “ “	1.11
6.	“ “ “	1.05
7.	“ “ “	0.88
8.	“ “ “	1.09

A number of samples of baking soda were examined for the purpose of determining the amount of alumina which might be present as an impurity in the process of manufacture. While traces were present in all cases, the amount was too small to admit of weighing.

Cream of Tartar.—This is the acid or bi-tartrate of potassium, and is used both in medicine and in culinary preparations. Its comparatively high price renders it an article of very general adulteration. Of the twenty-seven samples examined, sixteen were adulterated and in some cases not a particle of cream of tartar was to be found. Six samples were adulterated with terra alba and starch, one with starch alone, and two with starch, terra alba and acid phosphate of calcium. In six samples tartaric acid had been substituted for cream of tartar and in each case the sample was otherwise adulterated. Tartaric acid possesses

greater acidity than the acid tartrate of potash and hence its substitution allows the addition of more foreign matter and at the same time the maintaining of a certain degree of acidity. In eight samples the amount of terra alba was determined and found to range from 3.27 to 93 per cent. Five samples contained over 70 per cent. of this adulteration.

Cream of tartar, unless chemically pure, contains a certain amount of tartrate of lime as an impurity. This compound is not injurious, but of course diminishes the value of the salt by introducing so much inert matter. So far as I am aware, no limit to this impurity has been fixed, even in its use medicinally, although there seems to be no reason for not establishing some limit. The amount of tartrate of lime in commercial cream of tartar varies from two to fifteen per cent., but six or seven per cent. may be considered as a fair average. Of the twenty-seven samples examined, the tartrate of lime was determined in twelve of them which were not adulterated. The amount varied from a trace in one sample to 10.59 per cent. as a maximum. Nor did the article as sold for medicinal purposes appear in any way superior to that sold by grocers.

The following table gives the results of the twelve samples examined:

		Tartrate of lime.
1.	Bought of a grocer.....	3.54 per cent.
2.	" "	10.47 "
3.	" "	9.08 "
4.	" "	6.25 "
5.	" druggist.....	10.38 "
6.	" "	10.03 "
7.	" "	8.78 "
8.	" "	5.50 "
9.	" "	8.97 "
10.	" "	6.62 "
11.	" grocer.....	a trace "
12.	" "	10.59 "

Baking Powders.—These are artificial preparations employed as substitutes for yeast in the raising of bread, biscuits, etc. They consist of bicarbonate of soda and some acid or acid salt which, upon the addition of water, react on each other with the elimination of carbonic acid gas. The bicarbonate of soda is common to them all, but various acid compounds have been employed to liberate the gas, and from them the powder naturally takes its name.

There are four classes of baking powders in common use. In the first cream of tartar is employed, in the second tartaric acid, in the third acid phosphate of calcium, and in the fourth potash or ammonia alum. Moreover many powders contain a salt of ammonia. In the alum powders it occurs as a constituent of the alum itself, while in others it is, as a rule, introduced as the sesquicarbonate of ammonia. The pungent odor which this salt possesses prevents its use in any but the smallest quantities, and so used it cannot be considered as in any way affecting the wholesomeness of the powder. Experience has shown that when the acid compound and the bicarbonate are mixed, a reaction gradually takes place between them, which liberates the gas before it is needed, and results in a certain deterioration of the powder. To

counteract this, flour or starch is generally added to the mixture, which increases the keeping quality of the powder, although it cannot entirely prevent the deterioration. This "filling" as it is called, cannot be considered as objectionable if used only in such amounts as are necessary to preserve the powder, but it may be added in such quantities that it will be nothing more nor less than adulteration. To define adulteration in this connection would necessitate the fixing of some limit to the amount of flour or starch which might be added. There are certain difficulties which attend the fixing of such a limit. The various mixtures of bicarbonate of soda with acid salts do not furnish the same percentage of gas, inasmuch as some of these salts possess greater acidity than others. It follows that the manufacturer employing the salt of greatest neutralizing power might justly claim the right to use more filling, inasmuch as his powder would have greater strength, or liberate a larger percentage of gas. To avoid this difficulty it would be necessary to fix some standard amount of gas which the different powders should yield, and then the question of "filling" would regulate itself. Just what such a standard of available gas should be it would be difficult, and without considerable experiment, impossible to decide. The amount of filling which I have found ranges from 20 to 60 per cent., although it may be more than that in powders in which it was not determined.

Eighty-four baking powders have been submitted to me for examination, which on analysis I find to be divided as follows:

Cream of tartar powders.....	49
Tartaric acid powders.....	3
Alum powders.....	20
Phosphate powders.....	3
Cream of tartar and alum powders (mixed).....	8
Phosphate and alum powders (mixed).....	1

84

Seventy-three contained either flour or starch, while eleven had no filling whatever. Thirty-five contained ammonia in some form of combination. Of the total number examined, eight powders were adulterated, six with terra alba, one with insoluble phosphate of calcium, and one with tartrate of lime, doubtless as an adulteration of the cream of tartar employed.

FLOURS, BREAD, ETC.

Flour.— The term flour, in its more restricted sense, is applied to the powder obtained by grinding the various cereals used as food.

The object of this paper being to ascertain the extent and nature of adulteration with the view of applying some correction for the evil, it is obviously foreign to such purpose to enter into any elaborate description of the nature of the different flours, or discussion as to analytical methods, except so far as it is necessary to reach the object in view.

Wheaten Flour.— It is somewhat unfortunate that any of the cereals and cereal preparations submitted for examination were "free" samples, since it would seem to indicate a certain amount of knowledge as

to the purpose in obtaining them, and consequently warrant the inference that they represent the best quality sold in the State, and not the poorest nor even an average quality. On the other hand I have no information to warrant the supposition that there is any considerable adulteration practiced.

Thirty-three samples of wheat products were submitted to me for examination, including eight samples of "gluten flour," and three samples of "farina," besides several samples of graham flour. There are quite a number of "gluten flours" on the market, which are supposed to contain a special addition of gluten. The samples which I have examined I find to be free from adulteration, and while some contain little or no more gluten than is normally present in wheaten flour, others are honestly deserving of the name—gluten flour. These conclusions I have reached by microscopical examination, the chemical analysis necessary to determine the relative value of these flours, I have not had the time as yet to complete.

The samples of "farina," which consist of finely granulated wheat, were found of excellent quality, as also the samples of wheaten flour and graham flour, the latter consisting of the unbolted flour of wheat.

The adulterations of wheaten flour may consist, first, of an admixture of foreign flour or meal, as that of barley, corn, bean, rice and potato, or secondly of mineral matter, as alum, clay, chalk, etc. The addition of corn meal to flour is reported as having occurred in this country, although I have not noticed cases of this kind; the addition of mineral matter is of rare occurrence. Damaged flour is sometimes placed upon the market, mixed either with good flour, or with some mineral matter, as alum, the action of which is to disguise its inferior quality. The use of alum, so far as it acts injuriously upon the human system, will be considered elsewhere, but its employment in damaged flour should be emphatically condemned, aside from the question of its wholesomeness. In damaged flour the gluten has undergone a partial decomposition or fermentation, giving a dark appearance to the flour. The alum acts as an antiseptic, checking this decomposition and giving a bread much whiter than could otherwise be obtained. For the same purpose it is sometimes added to sound flour to give an unnaturally white bread.

Another cause of deterioration in flour and one occasionally met with is the presence of some animal or vegetable parasite of the grain; and of these, smut, mildew, darnel, rust and ergot are the most important. The limits of this paper will not allow any discussion of these parasitic growths, nor of the more common animal parasites. There seems, however, to be sufficient ground for the statement that some of the ill effects generally attributed to other causes are in reality due to a vegetable parasite. From my own experience I am inclined to think that darnel will be found much more frequently than other vegetable parasites, and even this I have not noticed except in carelessly cultivated cereals.

Of the other cereal preparations which I have examined little need be said. They are as a rule free from adulteration, and the methods for detecting the adulterations of wheaten flour apply also in the case of other flours and cereals.

Oatmeal, Rye, Barley.—Twelve samples of oatmeal, ranging in price from five to fifteen cents per pound, seven samples of barley preparations and the same number of rye products were submitted for examina-

tion. They were found to be free from adulteration with the exception of one sample of rye flour, which had received an admixture of an inferior wheaten flour.

Corn Meal.—I have examined ten samples of corn meal, both yellow and white, and two of corn starch. The latter consist of the fine flour of corn and are of good quality, while the former contained nothing worse than meal worms, and these in but a few instances.

Rice.—Five samples of rice and rice flour were examined, and in no case were foreign substances found. The rice grain, as that of other cereals, is not liable to adulteration, although on a previous occasion I found considerable white sand present in one sample.

Buckwheat.—Eight samples of buckwheat flour were submitted, and in only one instance was there indication of adulteration. That consisted in the addition of wheaten flour.

Sago and Tapioca.—Sago is obtained from the pith of several varieties of palm, and in the form of meal or flour consists of a white powder. As sold in the shops, however, it generally consists of small grains, in the preparation of which heat is employed, and hence the shape of the starch granules is materially modified. Tapioca is obtained from the farinaceous root of various species of *Manihot*. It is found in commerce as granulated, pearl or flake tapioca, and the same starch when prepared without the aid of heat is often known as Brazilian arrowroot. Sago and tapioca are sometimes adulterated with potato starch, but this and other foreign matter are readily detected by the aid of the microscope.

Five samples of sago, and seven of tapioca were examined. The latter were free from adulteration, but in the case of the sago two samples consisted entirely of tapioca.

Arrowroot.—Genuine arrowroot is the starch obtained from the tubers of *Maranta arundinacea*. The term, however, is also applied to a number of other starches, notably those from *Canna edulis*, or Tous les mois arrowroot, *Tacca oceanica* or Tahiti arrowroot, *Arum maculatum* or Portland arrowroot, and *Curcuma angustifolia* or East Indian arrowroot. Corn, rice and potato starches are often called arrowroots, and there is therefore much confusion with regard to the use of this word. This confusion is rather increased by applying to the arrowroots some name supposed to indicate the place of their production, as Bermuda, St. Vincent, West India, etc.

The adulterations of maranta arrowroot are confined almost exclusively to the admixture or substitution of some cheaper starch. Taking the term arrowroot, in its more comprehensive sense, it includes substances composed solely of starch, and hence adulteration would be the substitution of a starch of less commercial rather than dietetic value. As a general thing the cheaper starches are sold at the same price as the genuine article, and therefore constitute a fraud upon the public.

It is evident that the remedy consists, in the first place, in requiring all dealers to mark the arrowroot with the name of the plant from which it is obtained. This is done in a few cases at present, but usually the geographical name is affixed. Mixtures of different starches should be marked as such. The microscope affords the only reliable means for detecting the adulteration of arrowroot with foreign starches.

I have examined twenty-three samples of commercial arrowroot, of which seventeen consisted entirely of maranta starch, and six of sub-

stitutions; one was a mixture of maranta and tapioca starches, two were maranta, tapioca and potato, and three consisted of tapioca and potato starches.

Bread.—Ten samples of wheaten bread were submitted to me, and in no case did the chemical or microscopical examination show adulteration. The samples in most cases represented the cheaper class of breads, the price of which is five or six cents for a loaf of from thirteen to fifteen ounces.

I determined in each sample, first, the moisture; second, the ash; third, the silica and sand; fourth, the phosphates of alumina and iron. The last was necessary in order to ascertain whether the samples had been adulterated with alum. Tests were also made for the sulphate of copper, but in no instance was it detected.

The results of the analyses are given in the following table:

No.	Moisture. Percentage.	Ash from 100 grms. of bread. Grms.	Silica and sand from 100 grms. of bread. Grms.	Phosphates of alumina and iron from 100 grms. of bread. Grms.
1.....	41.60	0.997	.0028	.0039
2.....	43.60	1.134	.0078	.0073
3.....	43.34	1.006	.0041	.0057
4.....	43.77	0.983	.0047	.0039
5.....	41.54	0.943	.0048	.0058
6.....	41.54	1.035	.0055	.0051
7.....	43.46	1.113	.0071	.0051
8.....	43.41	0.915	.0089	.0060
9.....	43.88	1.025	.0026	.0045
10.....	41.89	0.915	.0078	.0060
Aver.....	42.80	1.0066	.0056	.0053

It should be stated that the examinations were made on the day the bread was baked, and only the crumb was taken for analysis.

It will be seen that more than half of the samples of bread examined contained over forty-three per cent of moisture. This quantity is certainly in excess of what should exist in well-made bread; but at the same time, the figures may be taken as representing the amount of moisture in ordinary bakers' bread when fresh.

It is a matter of some difficulty to fix a limit to the amount of moisture allowable in bread. Mr. Wanklyn is of the opinion that well-made bread should not contain more than thirty-four per cent of water, while other writers fix a higher limit. In England, where bread is sold by weight, the unscrupulous baker may aim to overweight the bread with moisture and under such circumstances some limit would be very desirable, but as no such limit has been established in England, it would be difficult to settle upon a limit in this country where bread is generally sold by bulk.

In the above analyses the amount of ash is about the average of unadulterated breads. Moreover the silica and the phosphates of alumina and iron are only what would naturally occur in the ash of the flour.

METHODS OF EXAMINATION.

The microscope must be relied upon almost exclusively for the detection of the various starches, and abnormal vegetable growths. A few remarks on the identification of the starches will be found in the latter part of this paper.

The detection and estimation of mineral adulteration, are readily accomplished by ordinary analytical methods. The determination of alumina, however, for the purpose of deciding the presence of alum in flour and bread, requires considerable care, inasmuch as the amount of alumina even in alumed flour or bread is very small, and might be confused with that naturally present in the ash of the flour itself. It is customary to make a certain allowance for the alumina of the ash, but no fixed amount has been agreed upon by analysts. Various writers allow from three to ten milligrams of phosphate of alumina in one hundred grams of bread.

In preparing this paper the comparatively small number of analyses which have been made, having this particular point in view, do not warrant a suggestion as to the proper limit, and moreover the matter is one which can be easily settled when the alum question is disposed of.

After repeated trials of the various methods commonly employed in determining alumina, I am of the opinion that the one suggested by Mr. Dupré (*48), and modified by Mr. Wanklyn (155), is best suited to the determination of the alumina in flour and bread. It depends upon the insolubility of the phosphate of alumina, and the solubility of the phosphates of calcium and magnesium in acetic acid.

Mr. A. W. Blyth (14) has recently proposed a new method for the quantitative estimation of alum in bread, which is based upon the separation of the alum, and of any phosphate of alumina by their solubility in a five per cent solution of hydrochloric acid. The silicates of alumina are not acted upon by an acid of this strength, so that the alumina natural to the flour does not interfere with the determination of alum which may have been added.

The analyses of bread already given, were made before the publication of Mr. Blyth's paper, so that no opportunity was afforded for making a comparison between the method suggested, and that of Messrs. Dupré and Wanklyn.

While Mr. Blyth does not claim to have established the superiority of the hydrochloric acid method, it appears probable that it will afford a more reliable means of detecting the presence of alum in flour and bread.

A qualitative test for alum which has received considerable attention deserves mention here. It is based upon the fact that flour or bread containing alum is colored blue or lavender by a tincture of logwood. This test was applied to the samples of flour and bread examined, and in no case was the presence of alum shown. The test was applied according to the directions given by Mr. J. C. Bell (8). The tincture is prepared by digesting sixteen grams of freshly-cut logwood in cold methylated spirit for eight hours, and pouring off the clear liquid. "For bread, about ten grams of the crumb are taken, and a mixture consisting of 90 c.c. of water, 5 c.c. of the logwood solution, and 5 c.c. of a saturated solution of carbonate of ammonia is poured over the

*These numbers refer to the bibliography at the end of this paper.

bread in a porcelain dish. If the bread contains alum, a dark lavender-blue soon makes its appearance." The bread is washed and dried, when, if the color remains, it is taken as indication of the presence of alum. In applying the test to flour, ten grams are mixed with 10 c. c. of water, and to this are added 1 c. c. of the logwood solution, and 1 c. c. of the carbonate of ammonia solution. Pure flour gives a pinkish color, but if alum is present the color is a lavender-blue.

Of course in the use of such tests as this, confirmatory tests should be applied, and where prosecution is contemplated, quantitative determinations should be made.

Mr. Blyth, in the paper already referred to (14), suggests an improvement in applying the logwood test. It depends upon the known property which gelatine possesses of uniting with alum. A small piece of gelatine is digested with the suspected sample of flour or bread until quite soft, after which the logwood test is applied.

THE ALUM QUESTION.

In the making of bread, and foods of a similar nature, alum is sometimes added to the flour for one of two reasons, either to disguise the inferior quality of a damaged flour, or in combination with other substances as a substitute for yeast, in the form of a baking powder.

Aside from the question of the wholesomeness of alum, its use in remedying the defects of damaged flour cannot be looked upon as other than a very objectionable form of adulteration, which should be emphatically condemned. The action of alum on flour is to toughen the gluten, and retard those changes in the process of fermentation produced by the use of yeast, and which if allowed to go too far, would render the bread heavy and sour. In the use of damaged flour this effect of alum is of the greatest importance and enables the unscrupulous to make a bread possessing the appearance of a first-class article, from material unfit for human food.

The almost universal use of baking powders in this country, and the fact that a large number of them contain some form of alum renders the question of their wholesomeness one of interest and importance. The question as it has been discussed in England and France has referred more to the use of alum in breads when employed to improve the appearance only, and in this case certainly it is of the nature of an adulteration. In this country, on the other hand, the question which commands more immediate attention is the use of alum in baking powders where it plays a part which must be performed by this or a similar substance if the powder is to accomplish its object.

Much has been written and many varying opinions expressed as to the action of alum on the human system. Most or all of these opinions seem to be based upon theoretical grounds, and I do not find that any systematic experiments have been made to settle the question. I am not speaking of the use of alum medicinally, but as it might be taken in articles of food in combination with other substances; and in the following pages I shall endeavor to bring to the surface the opinions on both sides.

Some persons have argued the question apparently upon the physiological effect of alum as given in works on *Materia Medica*, concluding that its effects, as usually taken in food, are necessarily the same.

According to Dr. Pereira (121, p. 230) "the immediate *topical* effect of a solution of alum is that of an astringent, namely, corrugation of fibres and contraction of small vessels, by virtue of which it checks or temporarily stops exhalation and secretion, and produces paleness of parts by diminishing the diameters of the small blood vessels. It is by these local effects that alum, when taken internally, causes dryness of the mouth and throat, somewhat increases thirst, checks the secretions of the alimentary canal, and thereby diminishes the frequency and increases the consistency of the stools. But when alum is applied to a part in larger quantities, and for a longer period, the astringency is soon followed by irritation, and the paleness by preternatural redness. And thus taken internally in large doses, alum excites nausea, vomiting, griping, purging, and even an inflammatory condition of the intestinal canal—effects which may be perhaps induced by small quantities in persons endowed with unusual or morbid sensibilities of the stomach and bowels." He also adds that "alum becomes absorbed," and states that Orfila detected alumina in the liver, spleen and urine of animals to whom alum had been administered. Other opinions on this point are not necessary, as those who advocate the use of alum would hardly deny the truth of Dr. Pereira's statement; but it is urged that the alum is decomposed in the baking process and consequently does not enter the system in the form of alum, but as the hydrate or phosphate of alumina. Moreover that the quantity is small, and like many other substances produces injurious effects only when taken in larger quantities.

Prof. Liebig (86, p. 541) says that when alum is added to bread it is decomposed, the phosphoric acid of the flour uniting with the alumina to form a phosphate of alumina, difficultly soluble in acids and alkalies.

Dr. Hassall (67, p. 349) says on this point that "when alum is added to flour or bread, it becomes decomposed, sulphate of potash, an aperient salt, being formed." Mr. Blyth (13, p. 33) says that "when water is put to dough, the alum (unless, indeed, it has been added in excessive quantities) is broken up and ceases to exist as alum." Dr. Parkes (113, p. 246) says "when mixed with flour and baked, the alum is decomposed, part of the alumina combines most strongly with phosphoric acid; and either this or the alum itself is presumed to be in combination with the gluten; bisulphate of potassium is probably formed." He adds on the following page "there is little doubt of the formation, and none of the insolubility of phosphate of alumina." From this it seems probable that alum as such does not enter the system, but is decomposed previous to and during the process of baking.

In the use of alum baking powders, the addition of water effects the reaction between the alum and the bicarbonate of soda, forming the hydrate of alumina, together with sulphate of soda and sulphate of potash or ammonia according to the nature of the alum.

Prof. Liebig thinks the phosphate of alumina is ultimately formed and that it is insoluble, in which case it would be unacted upon by the digestive fluids. Mr. J. W. Knights in the Norfolk Baking Powder Case (107 p. 231) testified that alum was converted into a phosphate, with a small quantity of the hydrate of alumina, that this phosphate was insoluble and destroyed "all the beneficial effects of bread made from flour." Further on he says "alum is a strong astringent," etc. If the alum is converted into an insoluble compound, why discuss its astringent properties; and again, is there nothing beneficial in bread but the

phosphoric acid? Prof. Muir (107, p. 232) is of the opinion that the baking powder acts upon the greater part of the soluble phosphate of the flour and forms an insoluble phosphate of alumina.

Dr. Tidy (107 a, p. 31) doubts whether the phosphate of alumina is formed at all, and even if it is formed, he is confident that it would be dissolved in the gastric juices. Mr. Sutton (107, p. 233) denies that alum baking powder in bread tends to harden the gluten and make it indigestible. "The phosphate would be perfectly inert and harmless to health." He also made some experiments with bread raised with powder and also with yeast, and determined the phosphoric acid present. The yeast bread gave 3.04 grains of phosphoric acid as phosphates soluble in cold water, while the bread made with baking powder gave 2.32 grains, showing that comparatively little of the phosphoric acid was rendered insoluble by the hydrate of alumina. Dr. Thudicum (107 a, p. 31) thinks that the phosphate of alumina, if formed, would be entirely decomposed by the gastric juice of the stomach; and with regard to the loss of phosphoric acid in the human body by the use of an alum powder, he adds, "that it would be quite inappreciable and of no consequence whatever." Prof. S. W. Johnson (101, p. 118) does not recognize the conversion of the hydrate of alumina into the phosphate, and he considers that the hydrate would be dissolved by the acid fluids of the stomach and so have the same effect as any other soluble salt of alumina. There appears therefore to be considerable doubt as to whether the phosphate of alumina is formed or not. If the phosphate is formed there is reason to suppose that it is decomposed by the fluids of the stomach, although this is by no means an established fact, and just how far the new compound resembles an alum in its properties there is some uncertainty. There is no ground for concluding, however, that its action is the same as that of the original alum.

The literature on the subject of alum in bread making, has of late years become so voluminous that it would be impossible within the scope of this report to give more than a few representative opinions.

Liebig's objection to the use of alum was that it rendered the phosphoric acid of the flour insoluble, and also that it permitted the use of damaged flour.

Dr. Pereira (120, p. 311) says: "Whatever doubts may be entertained regarding the ill effects of alum on the healthy stomach, none can exist as to its injurious influence in case of dyspepsia."

If alum or the hydrate or phosphate of alumina into which it may be converted in the process of baking has any injurious effect, the effect would be most and soonest felt by one whose digestive functions were impaired. While Dr. Pereira is quite positive as to its injurious effect, his conclusion seems to be based on theory rather than on actual experiment.

Dr. Desnos (41) writes: alum, or calcined alum, passing into the stomach in a state of hydrated alum, its toxical qualities are *very problematic*.

It is stated on the authority of Dr. Prosper de Pietra Santa that the Society of Physicians of London have condemned this adulteration with unanimity.

Prof. Alp. Chevallier (22, p. 20) regards the use of alum as injurious, and says that it should never enter into any alimentary preparation.

A. Trébuchet (149, p. 86) says: although it appears to have been

proven that alum may be administered medically in very large doses (8 to 24 grams) without any appreciable injurious results, and in spite of the very apparent harmlessness of the admixture of a small piece of alum to the bread, the Council of Health of Paris has seen fit that it should be forbidden to any baker to employ this salt (alum) in the making of his dough.

Dr. Daughlish (67, p. 344) says: "But its action in neutralizing the efficacy of the digestive solvents is by far the most important and unquestionable. The very purpose for which it is used by the baker is the prevention of those early stages of solution which spoil the color and lightness of the bread whilst it is being prepared, and which it does most effectually; but it does more than needed, for whilst it prevents solution at a time that is not desirable, it also continues its effect when taken into the stomach, and the consequence is that a large portion of the gluten and other valuable constituents of the flour are never properly dissolved, but pass through the alimentary canal without affording any nourishment whatever."

Dr. Pavy (116, p. 238) in speaking on this subject says: "In the first place, alum, or whatever it may be changed into, or whatever the combination formed with the flour under the agency of the heat employed in baking, is not a natural article for ingestion. Its properties are not such as to be likely to occasion any immediate or strong effect, and it cannot be said that a deleterious action is to be brought home to it in a precise or definite manner, but it is believed to be capable of producing dyspepsia and constipation."

Dr. Hassall (67, p. 349) says: "The use of alum in bread is particularly injurious, * * * it hardens the nutritious constituent of the bread, the gluten, * * * it enables the baker to adulterate his bread with greater quantities of rice and potatoes, * * * and lastly by the use of alum he is able to pass off an inferior and even a damaged flour, for one of superior quality. * * * Further, alum is very apt to disorder the stomach, and to occasion acidity and dyspepsia. * * * The manner in which it does so has not been clearly ascertained."

Dr. Parkes (113, p. 248) says: "A question like this is obviously difficult of that strict proof we now demand in medicine, and personally I have been able to come to no conclusion. Seeing, indeed that the usual effect of bad flour is flatulence and diarrhoea, if constipation were decidedly produced by bread, it would be more likely to proceed from alum than from any other ingredient of the bread." He considers that in view of the large quantity of alum often added to bread, if aluminium phosphate acts as an astringent, a person might take in an ordinary meal an amount sufficient to produce constipation. "Looking then to the positive evidence, and the reasonableness of that evidence, it seems to me extremely likely that strongly alumed bread does produce the injurious effects ascribed to it."

Mr. Blyth says (13, p. 33): "The influence of alum, on health, in the small quantities in which it is added to bread, is very problematical and rests upon theory more than observation. * * * But notwithstanding the obscurity as to its action on the economy, there can be no difference of opinion that it is a serious adulteration, and not to be permitted." As to the use of alum in baking powder it is employed as a substitute for some other acid salt as cream of tartar, or acid phosphate of lime, which have been considered harmless, and if the effect of alum

- on the health is problematical as Mr. Blyth claims, there seems to be no sufficient reason for prohibiting its use.

Mr. Church, A. H. (33, p. 69) says: "Alum and sulphate of copper are dangerous adulterants when added to a material in daily use like bread."

Dr. Thudicum in the Norfolk Case (107 a, p. 31) testified that he did not consider the use of the powder (alum) injurious. Dr. Tidy (107a, p. 13) testified in the same case that he did not think the powder injurious. Dr. Letheby, discussing a paper on Bread Manufacture (39, p. 260) said that the alum question was still a moot question; and Dr. Odling in the same discussion said he did not think the use of alum in small quantities prejudicial.

Some experiments have been made by Mr. J. West Knights (80, p. 18) to ascertain "the effects of the antiseptic power of alum in impairing the action of the solvent juices of the body." He prepared an artificial gastric juice by dissolving pepsin in very dilute hydrochloric acid, and subjected to the action of this fluid gluten obtained from pure wheat flour. Two grammes of the gluten were boiled ten minutes in pure water, then removed and on digesting in the gastric fluid at a temperature of from 90 deg. to 96 deg. F. was dissolved after five hours. Another portion of two grammes was first boiled in water containing a small quantity of alum, and then digested in the gastric fluid for five hours, when the undissolved portion was found to equal 1.05 grammes.

A third experiment was made in which the gluten was boiled in water containing small quantities of alum and bicarbonate of soda, and after treatment with the gastric fluid there remained .90 gramme of undissolved gluten, of two grammes taken. In the fourth experiment two grammes of gluten were first boiled in water containing alum and phosphate of soda. After being digested with the gastric fluid as in the previous experiments, .80 gramme of the gluten was left undissolved. "The results of these experiments prove that alum either alone or with bicarbonate of soda, or in the presence of soluble phosphates exerts a powerful action on the digestibility of gluten in the stomach."

Other experiments were made with two samples of bread, one of which was raised with yeast and the other with alum baking powder. A portion equal to 1.2 grammes of dry bread was taken from each, and after treatment with the gastric juice, the residue left from the yeast bread weighed .4 gramme, while that from the alum bread weighed .66 gramme, "thus showing that the pure bread was about one-third more soluble in the gastric juice than the bread that contained the alum baking powder."

Mr. Knights also calls attention to the injurious action of alum in hindering the solvent action of the saliva upon the starchy matter of the bread. For the purpose of showing this action experimentally, malt was employed, the diastase of which was considered to have an action similar to that of the animal diastase of the saliva.

"Two separate portions of malt were weighed, of one gramme each; to one portion one-tenth of a gramme of crystallized alum was added; both portions were then digested with equal quantities of hot water at a temperature of 160 deg. F. (a temperature very favorable for the conversion of starch by diastase), and maintained at that temperature half an hour; at the end of which time both samples were filtered; the filtered liquids were evaporated to dryness, and the residues which represented that

portion of the malt that had been dissolved by the mashing process, were weighed: the sample without alum had produced seventy per cent of soluble matter; the sample that had been treated exactly similar, with the exception that a small quantity of alum had been added, produced only eight and a half per cent. of soluble matter obtained from the malt."

It should be remarked that the amount of alum added in this experiment is four or five times greater than that employed in practice, and of course no such disastrous result would be produced as that given by Mr. Knights. In regard to all these experiments the question naturally arises, how far the experimenter has succeeded in imitating nature in the preparation of the artificial gastric juice, and also to what extent the subsequent experiments can be taken as representing the natural process of digestion.

In the first experiments no mention is made of the amount of alum employed, and judging from the last experiment it is possible that in every case, the amount was in excess of that used in the practical operation of bread making.

At best the methods of nature are very difficult to imitate and in conducting experiments to decide points of this kind natural conditions should be reproduced as far as possible. Some substances, considered as injurious, act very slowly and an exaggerated experiment is necessary to prove the nature of that action. At the same time when there are so many unknown quantities as exist in experiments upon the animal organism, long series of experiments under all the varying natural conditions of the subject are necessary in order to reach satisfactory conclusions.

There are on record a few cases of persons being taken sick after eating bread found to contain alum, but it has not been shown that the alum was the cause. Attention has already been called to the fact that alum is sometimes added to damaged flour to stop and partially correct the injurious effect of the fermentation, and it is not impossible that some of the effects ascribed to alum may be, as Dr. Parkes suggests, really owing to the flour. As the "usual effect of bad flour is flatulence and diarrhoea, if constipation were decidedly produced by bread it would be more likely to proceed from alum than from any other ingredient of the bread."

In 1840 Dr. Lefébure stated that several families of his clientage were suffering with gastro-intestinal ailments which he recognized were produced by bread containing alum. At least alum was found in the bread and it appears that he inferred that alum was the cause of the trouble.

I have used in my own family an alum baking powder for six weeks continuously. It was employed in making biscuit, and the amount of powder taken daily by each individual was equivalent to from seventeen to thirty-four grains of desiccated ammonia alum. It was impossible to detect any inconvenience whatever in the use of the alum powder, but it should be added that there are no dyspeptics in my family so that no opportunity was afforded for ascertaining the action of the powder under circumstances where any injurious effect would be most noticeable.

Legislation.—In England in 1821, during the reign of George IV, an act was passed which prohibited the use in the making of bread for sale, of alum or of any preparation or mixture in which alum was an ingre-

dient. The penalty for violation of the law was a fine from £5 to £25. By the Statute Law Revision Act of 1861, this was repealed, and the act as now in force in England does not forbid the use of alum, although public sentiment is generally opposed to it. It follows that under the English Sale of Food and Drugs Act, there can be no conviction for the use of alum unless the prosecution can establish the fact that alum is injurious to health.

In France the use of alum in bread-making is not allowed, although there is no law specially prohibiting it. This is fully explained in the following extract from an article on the subject of "alum in bread-making" recently prepared for the Sanitary Engineer by Dr. Prosper de Pietra Santa of Paris.

Art. I of the law of 1851, prohibits under penalties (fine and imprisonment) the adulteration of substances, either alimentary or medical, intended for sale; and since adulteration is defined to be the voluntary addition to any substance whatever of a product foreign to it, for the purpose of fraud or gain; and again since the regulations of the Prefecture of the Police do not admit in the making of bread of any other substance than flour, water, salt and raisings, it results that in France alum cannot be employed in the manufacture of bread.

In Germany both sulphate of copper and alum are forbidden in bread making. (42, p. 126.)

In conclusion it may be said that at the present time there does not seem sufficient evidence as to the injurious effects of alum upon the human system to warrant legislation against it. That alum as used ordinarily in bread making is unattended by any immediately injurious results seems reasonably certain, but further and more exhaustive experiments are necessary before the question can be satisfactorily settled regarding its action upon the human system, especially in cases of weak digestive organs. Experiments should be made upon subjects in ordinary health. To prohibit the use of alum on the ground that it is injurious to dyspeptics would be to subject it to a very severe test—a test which many articles of food of daily consumption could not stand successfully. Such a standard could be adopted only upon the ground that bread and like preparations were too important as articles of diet to have their value in any way impaired. Less objection is, at present, made to the use of alum than was the case several years ago, and still further experiment might show that even this objection was without foundation.

ON THE IDENTIFICATION OF THE MORE COMMONLY OCCURRING STARCHES.

The microscope forms a very important, and in many cases the only means, of detecting food adulterations, and nowhere is its usefulness more apparent than in the examination of the various starches.

It is an interesting fact that while the starches obtained from cereals, bulbs, seeds, etc., are identical in chemical composition, and, as a rule, present to chemical reagents no distinctive properties, each one has been given a form of its own with characteristics not shared with any other member of the group. For this reason the recognition of the different starches does not present any great difficulty, a careful study of the shape, size and peculiarities of each being all that is required.

The efforts which have been made to establish some microscopical

classification of starches, based upon the natural orders, have met with little success. Starches of different botanical orders often resemble each other more closely than those of the same order. The classification which more nearly meets the requirements is based entirely upon the microscopical appearance of the granules as regards the hilum, rings, etc. At the same time these classifications are of comparatively little service in the recognition of the starches. The characteristics upon which the classification is based will often be found to differ somewhat in different samples of the same starch; and sometimes the peculiar characteristics are entirely wanting. Moreover much depends upon the method of preparation and examination of the starch, and something must be allowed for the peculiarities of the observer. Where one would see lines or rings, another under the same conditions would not; and with variable factors existing in the light and magnifying power employed the difficulty becomes more evident.

Of the classifications proposed, the simplest is that of Dr. Parkes (113, p. 255). It includes, however, only the more common starches. A more complete classification is that of Dr. Muter (103, p. 172; and 103 a, p. 473); while a third is given by Dr. A. Vogl (152, p. 51).

The simplest and most satisfactory plan in the examination of starches is to have small specimens of the starches for comparison. They are conveniently kept in large-mouthed vials, and should be dry. Of course their origin and purity should be insured or they are quite useless. Mounted starches are not satisfactory for comparison.

In examining starches I have found that a mixture of water and glycerine (2:1) answers very well, although water, glycerine, Canada balsam, etc., are sometimes employed. As the mounting medium has more or less influence in bringing out the characteristics of the starch granules, it is important to employ the same medium both in the standard and in the specimen to be examined. A minute quantity of the starch is placed upon the glass slide, thoroughly moistened with a drop of the liquid and a glass cover put on. This should be pressed down very gently as excessive pressure or a grinding motion is liable to injure the starch granules. I prefer a one-fifth inch objective with B eye-piece, although a lower power is often recommended.

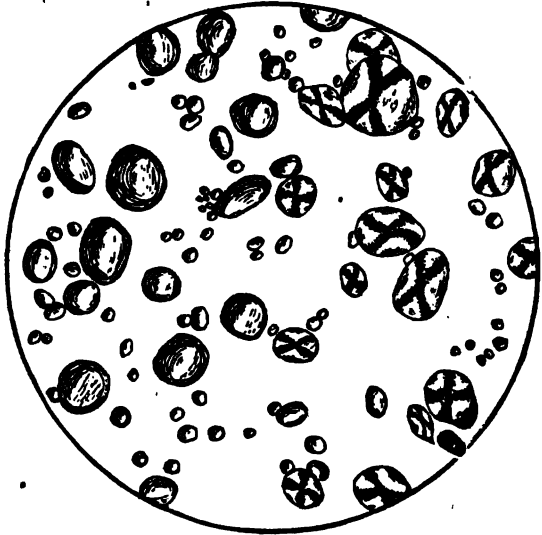
Polarized light is a very important aid in the identification of starches. By its use the rings are often more easily seen, and the position of the hilum is immediately ascertained, since the arms of the cross unite in the hilum. Some writers state that certain starches do not show the cross, and the statement has even been made with regard to wheat starch. This however is an error. The cross is readily seen in wheat starch, but with difficulty in the smaller starch granules, as those of rice and oat. I have noticed the cross in all the more common starches that are likely to come under the observation of the analyst.

The accompanying illustrations of the more common starches were drawn with the camera lucida, and reproduced from the drawings for the purpose of this report. The drawings of the sago and potato starches were made from microscopic slides which had been prepared for some time; in all other cases the drawings were made from fresh specimens. The illustrations represent on the right of the figure the appearance of the granules by polarized light, while on the left they are as ordinarily seen without this adjunct.

Wheat. The general form of wheat granules is circular, although

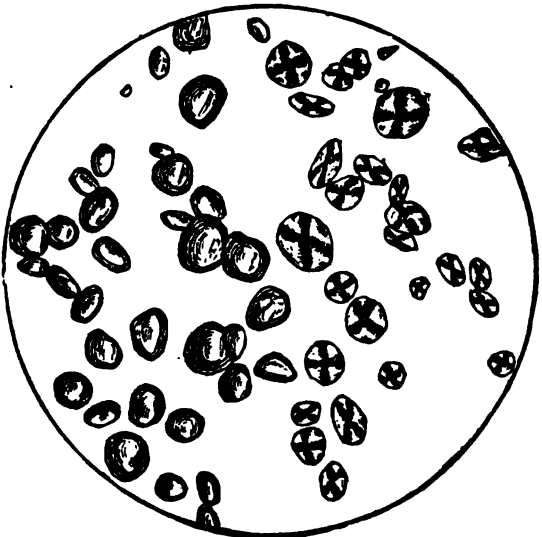
a few are elliptical, often irregularly so. As a rule the rings are invisible, but in the elliptical granules faint rings are sometimes seen. The hilum is occasionally seen as a central spot or short irregular fissure, but generally it is invisible. On looking at this starch the immediate impression is that two sizes of granules predominate — those of large size and others of very small size, with few intermediate.

The larger granules measure from .00111 to .00197 of an inch, while the small ones seldom exceed .00034 and often are only .00009 of an inch in length. With polarized light a cross is visible. In the circular granules this is dull and indistinct, but it is much clearer in those of elliptical form. With a green or red selenite plate, preferably the former, the circular granules show little change of color. In a few it is more decided, especially in the elliptical granules.



WHEAT STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

Barley.—The starch of barley presents the same general shape as the wheat granules, a few being elliptical but the greater number circular. In many granules the shape is slightly angular as though a piece had been cut off. In the majority of granules the rings are invisible, but in a few, faint ones are seen. The hilum is central, but is practically invisible. In looking at a slide of barley starch one misses the large number of very small granules so characteristic of wheat starch. The granules are of different sizes, a few are very small, being about .00018 of

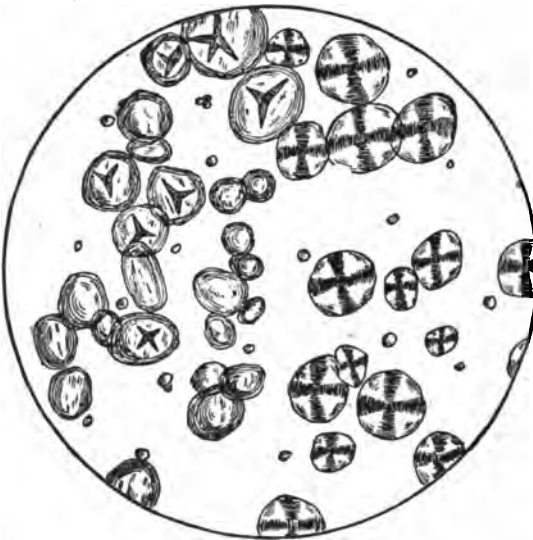


BARLEY STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

an inch in diameter, but the majority range from .0005 to .0015 of an inch. The largest granules of barley starch are smaller than the largest of wheat starch. The identification of barley starch in the presence of wheat starch is quite impossible, but separately they may be identified, the sizes of the granules however being the only ground for such identification.

With polarized light barley starch presents much the same appearance as wheat. The elliptical granules are brighter and show a more distinct cross, while in the circular granules it is very dull. With a selenite plate this starch appears the same as wheat.

Rye.—In form the granules of rye starch are as like those of wheat and barley as it is possible to describe them. The rings and hilum are also quite invisible in the majority of granules. In examining rye starch most microscopic fields present one or more granules which are marked by a deep fissure extending from the centre in the form of a three- or four-armed star nearly or quite to the circumference of the granule. I have not found these fissures so frequently nor of so



RYE STARCH. Drawn with the Camera Lucida and magnified 250 diameters.

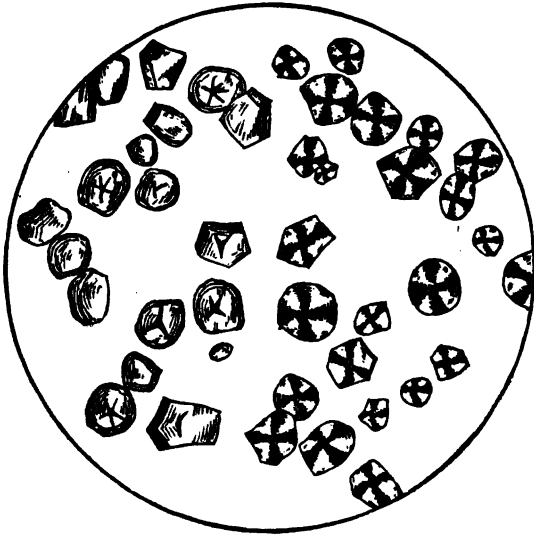
The small granules average about .00025 of an inch in diameter, while the larger ones vary from .0005 to .0018 of an inch. Rye starch, with polarized light, presents the same dull cross as wheat and barley starch, with an occasional brighter one. With a selenite plate it is like the preceding starches.

Corn.—Corn starch granules are as a rule polygonal in form, the angles being sharply defined in some and considerably rounded in other granules. A few granules are round. The rings are either invisible or seen with difficulty in a few of the larger granules. The hilum however is well marked and consists of a small central spot, or as seen

large size in the granules of wheat or barley; but their absence must not be considered as proving the absence of rye starch, as the fissured granules are of variable occurrence, and appear in some specimens more than in others, possibly depending upon the age and moisture of the sample. In size the largest of the rye granules are larger than those of wheat, and considerably larger than the largest of barley. There are also many very small granules, although not so numerous as in wheat

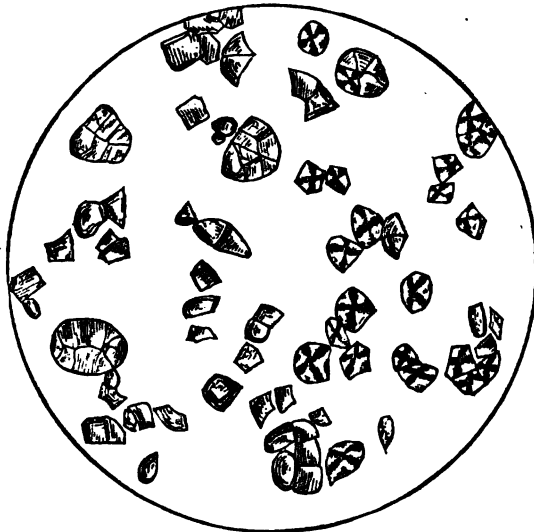
in the larger granules, of a straight or star-shaped fissure. The granules vary in size from .0003 to .0008 of an inch, and but seldom will granules be found to exceed these limits.

With polarized light corn starch granules present a distinct cross, the remainder of the granules being much brighter than with the average granule of wheat, barley and rye. The arms of the cross intersect in the centre of the granule. The colors as shown by a selenite plate are more brilliant than with wheat, but the effect is partly lost by the small size of the granules. The colors are more decided with the green plate.



CORN STARCH. Drawn with the Camera Lucida, and magnified 500 diameters.

Oat.—The starch granules of oat are generally polygonal in form, a few, however, are oval and others shaped like apple seeds. A peculiarity of this starch is the grouping together of these single granules into compound granules of considerable size. With sufficient magnifying power the compound nature of these large granules can be easily detected, but with low powers they might easily be, and indeed have been mistaken for single granules of large size. The form of the compound granules is generally oval, but occasionally they will be seen partly broken up into small granules. The rings and hilum are invisible unless the power employed exceeds one-fifth inch.



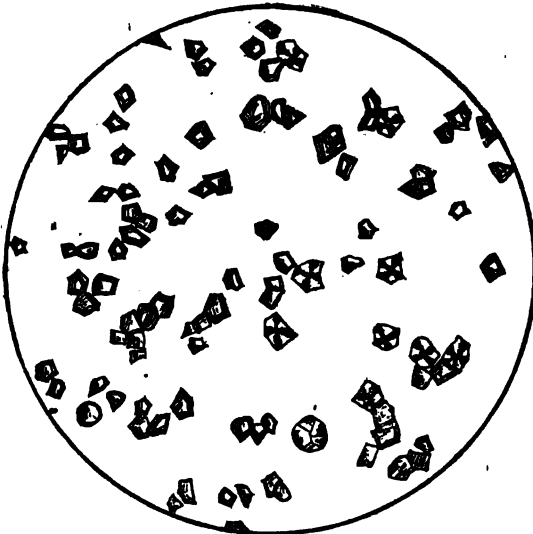
OAT STARCH. Drawn with the Camera Lucida, and magnified 500 diameters.

The granules vary in size from .00013 to .00045 of an inch, the average length being about .00035 of an inch.

The statement has

been made by some writers on this subject that the oat granules do not show the cross by polarized light. This, however, is an error. The cross can be seen with a one-fifth inch power, although it might be easily overlooked on account of the small size of the granules. The cross is not seen on first looking at the granules, but by slowly turning the analyzer, and looking at one particular granule the cross can be seen. In the largest granules it is, of course, seen most readily. It is also visible in the individual granules forming the compound granules. In no case, however, is it as distinct as might be inferred from the accompanying illustration.

Rice. Rice granules are, almost without exception, polygonal in form, generally with sharply defined angles somewhat resembling oat starch. The granules are often found in groups, as with oat starch,



RICE STARCH. Drawn with the Camera Lucida, and magnified 500 diameters.

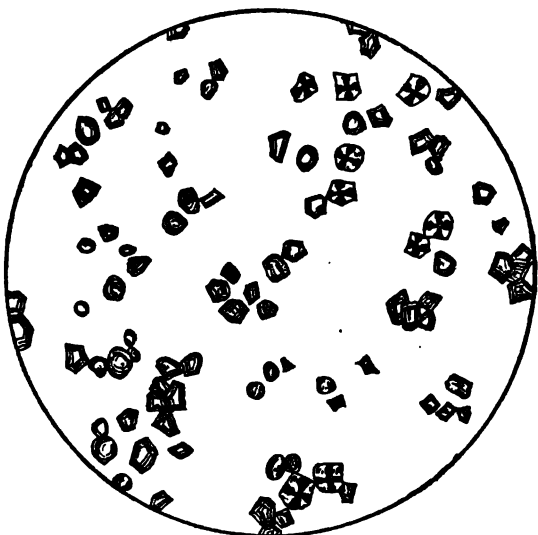
In the accompanying drawing the cross is shown in but a few of the larger granules. The selenite plate does not aid in the study of these small granules under polarized light.

Buckwheat. This starch somewhat resembles those of rice and oat in the shape of its granules, the prevailing form being angular. At the same time the angles are more rounded, and in a few granules the form is quite round. The granules are often aggregated into small masses as with rice and oat starches. No rings are visible; but with a one-fifth inch power the hilum may be seen in many granules as a central spot or a minute star-shaped fissure, much more distinct than in either of the two preceding starches.

This starch has received less study than most of those usually met with, and consequently there are fewer recorded measurements of the granules. Vogl gives the size as from .00052 to .00086 of an inch, and Hager as from .00059 to .00096 of an inch. A number of measure-

but with rice the outline of these masses is very irregular. The rings and hilum are not visible with a power of one-fifth inch and under; but Dr. Muter states that with a one-eighth or one-twelfth inch power the hilum becomes visible. The granules vary in size from .0002 to .0004 of an inch. With polarized light the granules of rice starch show a cross the same as oat starch, and although very faint and only visible in the largest granules it can be seen with a one-fifth inch power.

ments recently made of freshly prepared specimens gave from .0002 to .00053 of an inch as the size of the buckwheat granules. It seems probable that the measurements given by Vogl and Hager have reference to a species of buckwheat possessing naturally granules of larger size. With polarized light buckwheat starch presents a clearly defined cross which can be seen without difficulty. There is no very decided change of color by the use of the selenite plate.

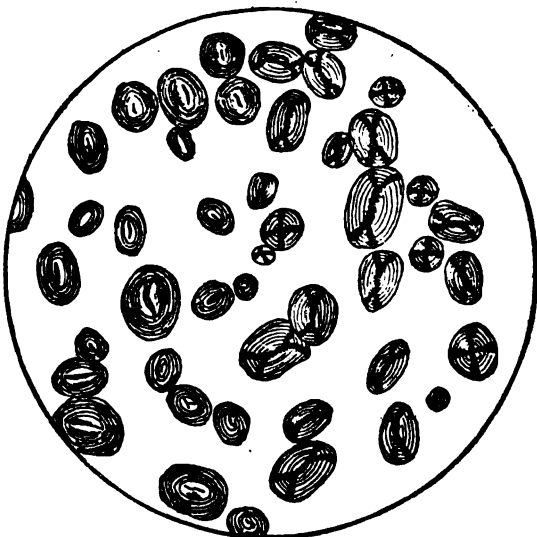


BUCKWHEAT STARCH. Drawn with the Camera Lucida, and magnified 500 diameters.

Bean. The granules of bean starch are generally of an oval shape, occasionally reniform or kidney-shaped. When magnified 250 diameters the concentric rings are visible, although somewhat faint. The hilum is very distinct as a central slit, in some cases being more or less branching.

The granules vary in size from .0008 to .0018 of an inch, with occasional ones as small as .0005 of an inch.

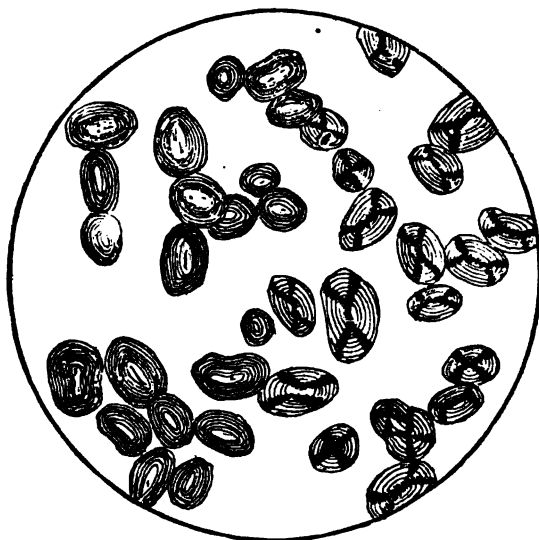
Under polarized light they present a very distinct cross, the remaining part of the granule being especially bright. In some granules the arms of the cross intersect at right angles, this being especially noticeable in those more circular in form; as a rule, however, the arms cross at an acute angle, producing a long, dark line of intersection through the centre of the granule. With a selenite plate, especially the green, the colors are unusually brilliant, although inferior to potato starch in this respect.



BEAN STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

With a selenite plate, especially the green, the colors are unusually brilliant, although inferior to potato starch in this respect.

Pea. In form the granules of pea starch are the same as those of bean, being oval and reniform. Some granules are very much enlarged at one end, and from the outline would be considered as a single granule. By the aid of polarized light, however, it appears that they are double granules, having two hilums and showing two crosses. A few triple granules are also seen. In a specimen of pea starch prepared from dried peas, and from which the accompanying illustration was drawn, the concentric rings were distinctly visible; but the hilum, on the other hand, was by no means as distinct as in bean starch. When it is visible, however, it resembles that of the bean granules. Writers on this subject have stated that the concentric rings are nearly invisible,



and the hilum even more distinct than in bean flour, and by some these are given as distinguishing marks between these two leguminous starches. It is evident, however, that little reliance can be placed upon such distinctive marks which are liable to vary with the specimen examined. It is a difficult matter to distinguish beanstarch from that of pea, and quite impossible to identify one in the presence of the other.

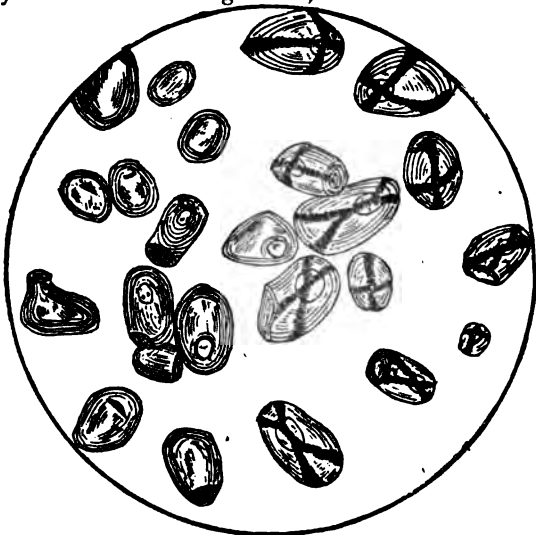
PEA STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

The granules of pea starch range from .0008 to .0020 of an inch in length. Under polarized light pea starch presents the same appearance as bean starch, with the production of a well-defined cross, and giving the same bright colors with a selenite plate. As a rule the reniform granules of pea and bean starches give a double cross. So far as I am aware no other starches show this with the same frequency.

Sago.—Both sago and tapioca as found in commerce consist of the meal which has been dried on hot plates. The effect of this heating is to cause the granules to swell and sometimes to burst, in which case they lose many of their characteristics. A few unaltered granules will be found in every case, so that the starch is readily distinguished, although more careful study is needed to determine adulteration with foreign starches. The figure represents prepared sago, the granules having undergone little change by heating.

The granules of sago meal are for the most part oval in shape. Many of them are abruptly terminated at the end opposite the hilum as though broken off, and they present a more or less plane surface. In prepared sago the shape is much the same, but many granules are ruptured, the proportion of these depending upon the degree of the heat to which the starch has been subjected.

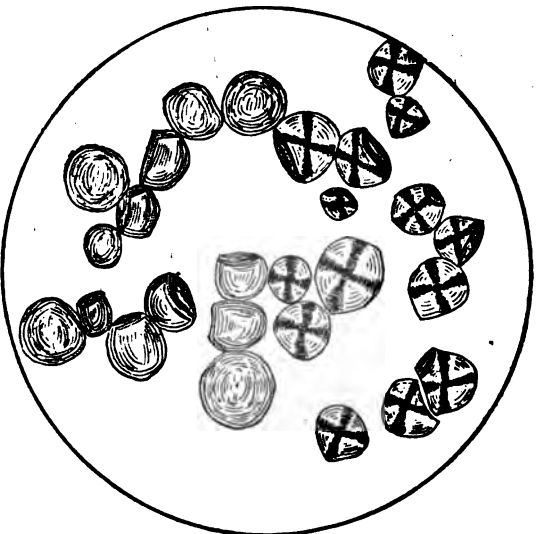
The rings are faintly visible in the sago meal, and these are still seen in a few granules of prepared sago. The hilum consists of a circular spot or frequently of a short slit or stellate depression, generally at the smaller end of the granule, but sometimes at the larger end. In prepared sago the hilum becomes a large oval depression, with occasionally the stellate hilum seen in the raw sago.



There is no difference in size between the granules of raw and prepared sago. They vary in length from .0012 to .0026 SAGO STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

With polarized light sago starch presents a well-defined cross closely resembling that of potato starch. The intersection of the arms of the cross is at the rounded and generally the smaller end of the granule. In prepared sago the cross is less distinct though visible; and if the granule is much ruptured the cross is very much distorted or even invisible. With a selenite plate the colors are very bright even in prepared sago.

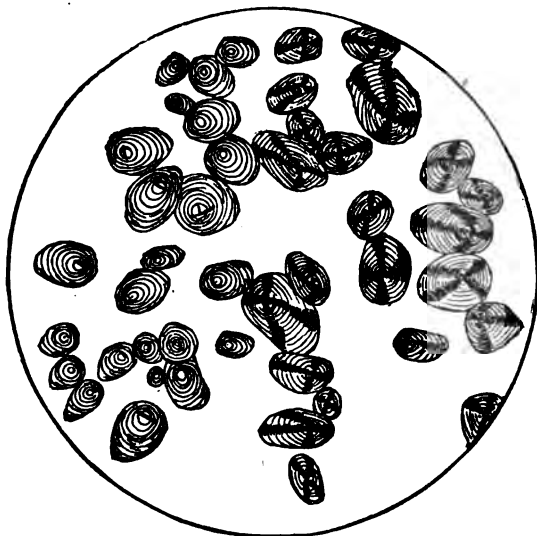
Tapioca, or Brazilian arrowroot.—This starch consists of small, roundish granules, for the most part circular at one end and plane at the other. A few appear perfectly circular. With a magnifying power of one-fifth inch no rings are visible. It is stated by some writers that rings are visible, and in such cases the starch was probably examined with higher powers. The hilum is readily distinguished as a small dot, or in a few granules as a short slit. In either case the hilum is central. The granules vary in size from .00044 to .00085 of an inch. TAPIOCA STARCH. Drawn with the Camera Lucida, and magnified 500 diameters.



As already stated the prepared tapioca of commerce will be found to have had many of its granules altered by heating. A few retain their original form, but most of the granules are enlarged and often distorted. Under polarized light the granules of tapioca meal present a distinct cross, with the intersection of the arms in the centre of the granule. In the prepared article the altered granules still show the cross, although it is much duller than in the meal, and often it is indistinguishable. With a selenite plate the colors appear with much distinctness.

Maranta or Bermuda arrowroot—The granules of maranta arrowroot slightly resemble those of potato in their general form. The majority are oval or pear-shaped, some irregularly so, and a few are elliptical and mussel-shaped. The rings are visible with a one-fifth inch power, although somewhat fainter than in potato starch. The hilum is visible in most granules, and consists usually of a short slit at the broader end of the granule, occasionally in the centre of the granule and very rarely at the smaller end. The slit generally runs across the granule but sometimes lengthwise. Its position at the broader end constitutes a prominent distinction between this and potato starch, in which the

hilum is at the narrower end of the granule. The granules of maranta starch are moderately uniform in size. The smallest are about .0006 of an inch in length, but the usual size is from .0008 to .0020 of an inch. With polarized light this starch presents a well defined cross similar to that of potato starch except that the centre of the cross is at the larger end of the granule. With a selenite plate the display of colors is very beautiful.



MARANTA STARCH. Drawn with the Camera Lucida, and magnified 250 diameters.

Potato or British arrowroot.—The granules of potato starch are mostly oval or pear-shaped. Some are elliptical and a few, noticeably the smaller granules, are circular. The rings are visible, and in most granules are very distinct. The hilum is seen as a small dot, generally at the narrower end of the granule.

There is considerable variation in the size of the granules. In the specimen from which the accompanying illustration was drawn, they varied from .001 to .0029 of an inch. As already stated this specimen had been mounted for some time. Other measurements made from fresh

specimens gave as high as .0035 of an inch, and some writers give as

high as .0055 of an inch. Payen gives the length of the granules of large Rohan potatoes as .0073 of an inch.

Potato-starch appears to great advantage under polarized light, because of the large size of the granules and the distinctness of the crosses which they present. By the aid of the selenite plate the colors are shown with remarkable beauty.



POTATO STARCH. Drawn with the Camera Lucida and magnified 250 diameters.

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GROUP V.

CANNED FRUITS AND VEGETABLES; PRESERVES; VINEGAR; PICKLES;
MUSTARD; GINGER; SPICES; ANTISEPTICS EMPLOYED IN PRESERV-
ING; GLAZING AND ENAMEL, AS AFFECTING FOOD-ARTICLES.

ALSO GROUP VII.

TEA; COFFEE; COCOA.

By S. A. LATTIMORE, Ph. D.

ROCHESTER, N. Y., *February 7, 1882.*

Dr. C. F. CHANDLER,

Chairman Sanitary Committee State Board of Health:

DEAR SIR—I have the honor to report to you that three hundred and forty-three samples of food articles have been, under your direction, submitted to me for examination.

The following tabular statement exhibits the names of the articles, the number of samples of each, and the result of the examination.

GROUP V. — *Canned fruits and vegetables.*

	No. unad'd.	No. adul'd.	Whole No.
Peaches.....	2	0	2
Plums.....	1	0	1
Grapes.....	1	0	1
Strawberries.....	2	0	2
Cherries.....	1	0	1
Blackberries.....	1	0	1
Olives.....	1	0	1
Mushrooms.....	1	0	1
Corn.....	1	0	1
Beans.....	2	0	2
Succotash.....	1	0	1
Tomatoes.....	1	0	1
Pumpkin.....	1	0	1
Peas.....	2	0	2
Vinegar.....	4	0	4
Pickles.....	8	1	9
Mustard.....	6	12	18
Ginger.....	6	9	15
Allspice.....	8	19	27
Cinnamon.....	4	18	22
Cassia.....	3	4	7
Cloves.....	5	16	21
Black Pepper.....	12	28	40
White ".....	2	5	7
Red ".....	5	5	10
Mace.....	4	4	8
Nutmeg.....	3	2	5

GROUP VII.— *Tea, Coffee, etc.*

	No. unadul'd.	No. adul'd.	Whole No.
Coffee, raw.....	30	5	35
“ roasted, unground.....	3	0	3
“ “ ground.....	2	19	21
“ extract, essence and surrogate....	0	3	3
Tea, green.....	43	0	43
“ black and mixed.....	18	0	18
Cocoa, and chocolate.....	6	0	6
Chicory.....	2	1	3

The word adulteration is here employed in the broad sense, including both substances injurious to health, whether present by accident or design, and substances which are not positively injurious to health, but manifestly added for the purpose of cheapening the cost to the manufacturer and defrauding the consumer.

No indication of adulteration was found in any of the canned fruits and vegetables. Attention was given to the possibility of the chemical re-action of the fruit acids upon the inner surface of the cans, whereby salts of tin and lead might be produced, rendering the contents in some degree poisonous. The application of the well-known tests for these metals failed to show any evidence of their presence. Some of these articles had been canned in the summer of 1880.

The four samples of vinegar were all of inferior quality, being deficient in acetic acid, but free from mineral acids, and must be classed as unadulterated, unless an excess of water may be considered an adulteration.

The nine samples of pickles gave no evidence of the presence of copper or other metal. The only sample which possessed a suspiciously green appearance was found to contain alum.

The remaining articles under Group V may be treated together for the sake of brevity. As the table shows, a large proportion of them are adulterated, and that with substances presenting a certain uniformity. The spices present an inviting field for the exercise of fraudulent arts. They are almost universally sold in the form of fine powder, and in opaque packages, which do not admit of easy examination on the part of the purchaser. Consequently any cheap substance which may be easily pulverized to a similar degree of fineness, and which possesses little distinctive taste or odor of its own, answers the purpose; so that the list of adulterants for this class of articles is naturally very large. The adulterations found in the samples now under consideration may be classed into four groups. First: integuments of grains or seeds, such as bran of wheat and buck-wheat, hulls of mustard seed, flax-seed, etc. Second: farinaceous substances of low price, and such as are damaged by the accidents of transportation or long storage, such as middlings of various kinds corn-meal, and stale ship's bread. Third: leguminous seeds, as peas and beans, which contribute largely to the profit of the spice mixer. Fourth: various articles chosen with reference to their suitability for bringing up the mixture as nearly as possible to the required standard of color of the genuine article. Various shades, from light colors to dark browns, may be obtained by the skillful roasting of farinaceous and leguminous substances. A little turmeric goes a great

way in imparting the rich yellow hue of real mustard to a pale counterfeit of wheat flour and terra-alba, or the defective paleness of artificial black pepper is brought up to the desired tone by the judicious sifting in of a little finely pulverized charcoal. Enough has been already given to show that the field for sophistications of this sort is a wide one, and offers large scope for the development of inventive genius; so that each manufacturer of articles of this class would be likely to possess his own trade secrets. It will be observed that the adulterating materials just mentioned all belong to the class claimed to be harmless. In no instance has any poisonous substance been discovered. The proportion of foreign and genuine substances in the spices varies between wide limits, in some instances the former being slight, in others, the latter seemingly present in just sufficient quantity to impart faintly the requisite taste or odor. Even this small proportion of the professed article is occasionally still further diminished by the substitution of other substances, as, for example, in imparting to corn meal finely ground, a pungency suggestive of real ginger by the addition of a little salt and red pepper.

GROUP VII.

Thirty-five samples of unroasted coffee have been received. In five packages, a few grains were discovered which had been slightly colored or faced. A minute quantity of blue pigment adhered to the more prominent parts of the bean, giving a somewhat brighter color to the coffee when viewed in the mass. It was apparently Prussian blue, the quantity obtained being too minute to permit satisfactory chemical tests. No lead chromate could be recognized. This coloring matter would all doubtless be separated from the coffee in the process of roasting when it is revolved in a wire cage over the fire. The coffee thus colored was of inferior quality and offered room for improvement. The three samples of roasted, unground coffee were of excellent quality and free from any admixture of foreign substance. The ground coffee, sold in packages, as the statistics show, was all, excepting two packages, more or less sophisticated. The foreign substances were generally found to be chiccory, beans, and less frequently, wheat or other grain coarsely ground. In one package marked coffee, with an ingeniously ambiguous qualification, no coffee at all was found, but roasted hominy. Three samples, labelled coffee-extract, coffee essence, and coffee surrogate, were composed chiefly of caramel and liquorice, and contained no coffee.

Forty-three samples of green tea, and eighteen of black tea have been received. Many of these are of the cheapest and most inferior quality, some of them mere tea-rubbish, yet no leaf, or fragment of a leaf, which has been examined could be considered any thing but tea. As to mineral matter I have not succeeded in detecting any thing which may not perhaps be fairly credited to the rude and careless manner in which it is handled by the rough employees of the tea farm. Neither have any positive evidences been discovered of the admixture of exhausted leaves. If they are present, the admixture is too slight to render detection possible by determination of the percentage of extract of tannin.

Of cocoa, and its preparations, one sample of cocoa nibs, and five of chocolate, were received. The latter being a professedly manufactured and mixed article, for which there is no standard formula, it could not properly be considered adulterated.

Three samples of chicory have been examined one of which was mixed with caramel and is therefore entered as adulterated.

METHODS OF EXAMINATION.

It unfortunately happens that in case of the great majority of food articles included in groups V and VII, the only positive means of demonstrating the presence of foreign substances requires special skill in the application of chemical knowledge or in the use of the microscope. Hence, any elaborate discussion of the detailed examination of each class of articles would be without value or interest to the public, and also to the expert chemist and microscopist, as I have found the usual and well-known methods of investigation fully adequate. The examination of canned fruits and vegetables for copper, tin, and lead, possibly derived from the metallic vessels in which they are prepared and preserved, is of course purely chemical. The search for foreign vegetable substances in the spices, coffee and tea, can depend only in a limited degree on chemical analysis, since many of these substances, however widely different in general appearance, and even in origin, are but slightly differentiated in their chemical properties. This difficulty, however, is most fully compensated by the marvellous variety of structure every where visible in all vegetable tissues. However similar the fruit, seeds, or leaves of two plants, even of the same order or genus, some constant and invariable difference of structure is sure to be found, which constitutes, in such investigations as these, the means of their instant and certain distinction. The eye must first be made familiar by patient practice with the structural characters of the genuine article, which is to serve as the standard of comparison. This being accomplished, a foreign fragment is instantly distinguished as foreign, whether its identity can be ascertained or not. Even this is an important step in the examination of a food article. But as these stranger forms are likely to occur frequently, and are not very numerous relatively, they are soon traced to their origin. Hence to the microscopist the discrimination, for example, of the starch grains of the various starch bearing tubers, grains and seeds, is as simple and, in fact, of precisely the same sort as the discrimination of the various fruits of the garden by the ordinary observer, who has acquired this power by repeated, though perhaps unconscious, comparisons.

The detection of the more common adulterations of ground coffee, presents an exception in some degree to the remarks just made, arising from two differences of the roasted bean from the substances commonly found mingled with it. The roasted coffee bean softens very slowly in water, while leguminous and farinaceous substances soften rapidly — it very slowly colors the water on which it floats or in which it sinks, while they generally sink more readily, and rapidly impart a brown color to the water. Hence by a little practice in crushing beneath the point of a knife, or between the teeth, genuine coffee and fragments of chicory, roasted peas, beans, etc., both having been previously well moistened, a very marked difference will be perceived and which may be found of much practical use. The widely published method of discriminating coffee from chicory, by the circumstance that the former will continue to float on cold water while the latter will rapidly sink, I have not found to be a trustworthy test. In this case, as in the others, however, the microscope constitutes the court of final resort.

Those who are interested in the detection of food adulterations by means of the microscope, will derive great assistance in the beginning of their work from the engravings and descriptions of microscopic structure contained in Dr. Hassall's elaborate treatise on *Food; its adulterations, and the methods for their detection; Bell's Analysis and Adulteration of Foods*, and other such books. The study of engravings, however, must not be expected to take the place of the vegetable tissue itself for practical purposes.

SPICE MIXTURES.

In addition to the samples of food articles already mentioned, I have also received a considerable number of the so-called *spice mixtures*. It is probably not so widely known as it should be, that the demand for the materials for adulteration has called into existence a branch of manufacturing industry of no insignificant magnitude, having for its sole object the production of articles known as *spice mixtures*, or *pepper dust*. The use of pepper dust, or as the article is commonly designated in the technical language of the trade, by its abbreviation, "P. D." is a venerable fraud. So long ago as 1820, when Frederick Accum made his memorable revelation in London, by the publication of his book on the *Adulterations of Food and Culinary Poisons*, he observed that "ground pepper is very often sophisticated by adding to a portion of genuine pepper, a quantity of pepper dust, or the sweepings from the pepper warehouses, mixed with a little cayenne pepper. The sweepings are known, and purchased in the market under the name of P. D., signifying pepper dust. An inferior sort of this vile refuse, or the sweepings of P. D., is distinguished among vendors by the abbreviation D. P. D., denoting dust (dirt), of pepper dust." P. 286. Indeed, much of this curious old and somewhat rare book reads as if it had just been written.

The manufacture of P. D. is now a regular branch of business, and the original and specific term pepper dust has expanded with the progress of inventive art to gigantic proportions, until now we have, as well known articles, sold by the barrel, "P. D. Pepper," "P. D. Ginger," "P. D. Cloves," and so on through the whole aromatic list. When it is considered that these imitations, lacking only such flavoring with the genuine article as the dealer thinks necessary to make his goods sell, are sold at from *three to four cents a pound*, and the retail price paid by the consumer is compared with it, the strength of the temptation to engage in such practices is clearly seen. When manufacturers openly advertise themselves as *assorters and renovators of merchandise*, and openly propose to *cleanse musty and damaged beans by a new and patented process*, it is full time that its significance should be considered by the public.

MANUFACTURED FOOD ARTICLES.

In the progress of this investigation, the subject of permitting the manufacture and sale of certain articles deprived of some of their natural constituents, or with the addition of certain substances, has frequently occurred. For example; mustard is generally deprived of its fixed oil in the process of manufacture, and is improved for all ordinary uses thereby. A similar practice is now extensively applied to cloves which

are not likewise improved, but robbed of the very constituent on which their value depends. It is proposed to sell mixtures of chiccory and coffee as such, stating the proportions of each on the package, so that no one shall be deceived. To this, and, in fact, to all similar propositions, it is to be objected, that advantage would immediately be taken of the fact that it would generally be difficult in the extreme, and, in some cases at least, absolutely impossible, to establish the fact in a court of justice, whether a definitely fixed proportion had been exceeded or not. Bearing in mind the wide difference between the ease of demonstrating, often by diverse methods, that a foreign substance *is present*, and the difficulty of demonstrating absolutely *its percentage by weight*, it will be plain how greatly the administration of the law would be simplified which should prohibit the manufacture and sale of all mixtures, with possibly a few exceptions, leaving to the consumer the privilege and pleasure of suiting his own tastes. Protection and even indorsement is claimed for some of these most worthless mixtures, on the ground that they are *harmless*, while the fact that they are counterfeit articles, as really as is a fictitious bank bill, is studiously left out of consideration. The simplest and best way is to require that things shall be called by their right names.

Very respectfully,

S. A. LATTIMORE.

GROUP VI.

SUGARS; SYRUPS; MOLASSES; GLUCOSE; CONFECTIONERY; HONEY,
AND SODA-WATER SYRUPS.

By W. H. PITT, M. D.

To the Chairman of the Sanitary Committee of the State Board of Health:

SIR—I have the honor to make the following report on the group assigned me for investigation.

GLUCOSE.

Since the glucose or starch sugar is now so largely manufactured, and finds a ready sale to brewers, sugar dealers and confectioners, I have devoted my attention especially to it. Although artificial glucose has been manufactured to a considerable extent in some of the countries of Europe for thirty or forty years, it is only within a comparatively short time that it has found a market in the United States. Considered as a sugar, it is entirely different from that made from the sugar cane. It is natural then, that consumers should look with no little degree of suspicion upon this starch product called glucose, which is sometimes mixed with cane sugar, and which is also extensively used in the manufacture of syrups, honey, and confectionery.

Physiologically considered, glucose, pure and uncontaminated with other compounds, is certainly a good and wholesome food.

As the question is often asked whether artificial glucose contains injurious compounds arising from the chemicals used in its manufacture, or produced from the starch itself, I have taken pains to examine its mode of manufacture, and have also made chemical analyses of several different varieties.

The following table shows the percentage of starch in several vegetable products, according to Krockers's Analysis:

	Starch.	Protein.	Fat.	Ash.	Fibrin.	Water.
Wheat.....	63.3	14.4	1.9	1.7	4.2	14.5
Rice.....	74.5	7.8	0.2	0.3	3.4	13.7
Corn.....	64.5	9.9	6.7	1.4	4.0	13.5
Potatoes.....	20.0	...	...	..	...	76.0

All efforts of the synthetical chemist to produce a substance having the properties of starch have proved unsuccessful; but he is enabled by chemical reagents to so act upon starch itself, that kindred products are obtained such as dextrine or starch gum, grape sugar or glucose. In 1811, Professor Kirchhoff, a Russian chemist, discovered that if starch paste be boiled for a certain time with a little sulphuric acid, a part of the starch is converted into starch sugar or glucose. From that time to the present, notably in Austria and Germany, the manufacture of glucose has been carried on with varied success. It is only within a few years, however, that this new branch of industry has developed to the enormous extent at present seen in the factories at Buffalo, Chicago, St.

Louis, and Peoria. The daily average consumption of corn in the American and in the Buffalo factories is 14,500 bushels, giving employment to 1,200 men, 300 or 400 of whom are kept at work making barrels and boxes for shipping the product.

From January 1, 1880 to January 1, 1881, the actual amount paid for work and labor by these two companies in the city of Buffalo was \$983,488.96. Less than one per cent of the quantity produced was sold in Erie county. The Firmenich factory uses 4,000 bushels of corn daily, and gives employment to about 400 men. We have in the aggregate, then, in these three factories a daily consumption of 18,500 bushels of corn, and employment given to 1,600 men.

It should be observed that starch in green fruits is changed into sugar during the process of ripening. In seeds, however, which contain the embryo plant, it is stored up mostly unchanged for the future growth of the plant. But as starch is insoluble in water at common temperatures, it could evidently in this state furnish no nourishment for the early stages of cellular growth. To render this universal plant food assimilable, nature has provided another substance, also in the plant, which contains nitrogen in addition to the elements of which starch is composed. This material of a variety of forms, is called the nitrogenous portion of the plant, and is very unstable or prone to change. In its decomposing condition it is called diastase. This so called diastase has the property when brought in contact with starch of changing it into glucose, which dissolves in water and is the chief food supply of the young plant. In imitation of the natural metamorphosis of starch, the chemist can bring about precisely the same change by adding dilute acids or malt. If starch-paste be boiled in water for a long time glucose is also said to be formed. The extremes of temperature 350 deg. Fahrenheit and 32 deg. Fahrenheit, acting upon starch, will convert small quantities of it into glucose. Boiling with almost any of the dilute acids has the same effect.

In this conversion, however, all of the starch does not become sugar, no matter what process may be used. When a certain proportion of sugar is produced, it appears to arrest further action. The remaining part of the starch, or at least the most of it, becomes dextrine or starch gum. Herein lies the great annoyance with which the manufacturers of glucose have to contend. It is hardly possible to make two samples of glucose containing a like amount of saccharine matter. Each time there will be more or less glucose, according to the quantity of starch gum produced at the end of the conversion. There will always be found, then, dextrine or starch gum in the sugar and syrup made from starch.

It is true that by careful management, converting under pressure, lessening the time, etc., the quantity of gum can be reduced to a minimum, but still it can always be detected, and forms a considerable percentage of the article sold as artificial glucose. The starch gum or dextrine is very easily converted into glucose after the sugar in solution is removed; but as it is also dissolved in the water, the cost of chemicals and the skill requisite for its removal make such an operation very unprofitable.

The dextrine when taken as food, and also the starch itself, are changed into glucose by the fluids of digestion, the action being apparently the same as in the case of diastase or dilute acids.

It is evident that the artificial production of glucose from starch by the acid process, the one in general use, can be most profitably carried on by using those grains, tubers, or roots which contain the starch in

the greatest quantity. Corn is found, from its abundance and high percentage of starch, to be the best material for this purpose in the United States ; but potatoes for a like reason, are mostly used in Europe. The process of conversion is essentially the same after the starch is extracted, although modified in detail according to the idea of different manufacturers in endeavoring to produce sugars of marketable grades. The following brief description of the manufacture of glucose as practiced at the American Grape Sugar Co.'s Factory, at Buffalo, may aid in obtaining a knowledge of the process.

The corn is steeped in water for fifty or sixty hours, during which time the water is repeatedly drawn off, and a fresh supply added every ten hours. About 1,000 bushels of corn are treated in each operation. After having been sufficiently steeped, it is thoroughly washed with a new supply of clean water, to rid it of all albuminoids or fermentable substances. While still in a moist condition it is ground by common mill-stones, and the resulting pasty mass is placed on sieves which are kept supplied with water. By this treatment the starch is washed through the sieve, while the coarser material, including the glutinous portion and about 50 per cent of the starch, is retained on the sieves. The wet bran, after being thoroughly dried, forms a perfectly wholesome and nutritious food for animals. In quantity it averages about eight pounds per bushel of corn used.

The starch which passes through the sieves is then run into settlers, which are cylinders ten feet in diameter, and eight or ten feet high, and allowed to settle four to six hours. After the starch has completely settled the supernatant water is run off as waste. The starch is then treated with a solution of sodic hydrate, to rid it of any remaining nitrogenous substances, after which the alkaline starch is drawn into shallow vats or tables, 100 feet long and allowed to settle. It is then washed repeatedly to remove the alkali, the operation requiring about sixty hours. Up to this stage of the process, a glucose factory is essentially the same as a starch factory. Fresh water is again added to the clean starch, and the whole mixture drawn off into the wooden converters. The temperature is raised to 100 deg. C. (212 Fahrenheit), and to the starch paste from one and one-half to two per cent of sulphuric acid are added, and the whole boiled for about three hours. At the end of this time the starch, or as much of it as possible, has been converted into glucose, and dissolved in the acid water.

It is not found in practice desirable to continue the acid treatment any longer or at higher temperatures, as the acid may so act upon the sugar formed as to produce traces of other compounds giving the sugar a bitter taste, etc. The acid sugar solution is now treated with marble dust or chalk, which combines with the acid, forming calcic sulphate, —gypsum, which, being insoluble; settles to the bottom, leaving the clear "sweet water" in a nearly neutral condition. To remove the last traces of sulphuric acid, lime cream is added until the test shows no free acid.

The settling of the gypsum requires from four to five hours. It is also subjected to other purifications, the details of which need not be stated here as they are merely mechanical, until the solution is as pure as possible. The sweet liquor is filtered through a filter press, at 15 deg. Baumé, after which it is filtered through bone-black filters and undergoes other purifications. It is then boiled *in vacuo*, at 130 deg. Fahren-

heit, to 40 deg. Baumé. This is common glucose, and is ready for shipment in barrels holding five or six hundred pounds. The above, mixed with 5-10-15-25 per cent of cane syrup to give it color and more sweetness, in the syrup of the grocers, and retail dealers—an analysis of which is here appended.

AMERICAN GRAPE SUGAR CO.'S SYRUP.

Analysis of mixed Glucose syrup.

Ash.....	.820
Water.....	18.857
Starch gum or dextrine.....	34.667
Cane syrup.....	7.805
Glucose.....	37.851

100.000

This syrup has slight acid reaction, which arises from the cane syrup as before mixing the glucose is neutral.

The confectioner's glucose is made the same as the above, with additional purification, and finished for market by evaporating to 42 deg. to 43 deg. B. It has a specific gravity of nearly 1.5, and is remarkably transparent, resembling molten glass, which probably gives it the name of "Crystal Glucose." It will not, at an ordinary temperature, run from a common bottle, so viscid and semi-solid is its nature.

AMERICAN GRAPE SUGAR CO.'S CONFECTIONER'S GLUCOSE.

The following is an analysis.

Ash.....	.431
Water.....	15.762
Starch gum or dextrine.....	41.614
Glucose.....	42.193

100.000

The solid glucose or grape sugar is made in copper converters under a pressure of 50 pounds per square inch, which brings about the transformation in a much shorter time than by an outside conversion under the common atmospheric pressure. It affords a greater amount of saccharine matter, and consequently less starch gum, as shown by the following analysis:

BUFFALO GRAPE SUGAR CO.'S GRAPE SUGAR, OR SOLID GLUCOSE.

Ash.....	.768
Water.....	17.169
Dextrine.....	14.055
Sugar, Glucose.....	68.008

100.000

The sample from which I made the above analysis, is probably about a fair average of what is denominated "70 per cent sugar." But I find this sugar varying from 68 per cent, to 70 per cent or even 72 per cent in saccharine matter. A sugar of about this grade, but harder, is made at the Firmenich factory, and finely cut or grated.

SUGAR.

Fifteen samples of sugar purchased in New York city were submitted to examination.

The water was determined by drying at 100 deg. C; the ash by igniting with sulphuric acid and deducting one-tenth (the French method) the glucose by Fehling's solution; the cane sugar by difference. The "glucose" includes dextro-glucose and lævo-glucose ("inverted sugar"); no attempt was made to ascertain whether any artificial dextro-glucose had been added by the refiner. From the low percentage of glucose in all the samples I should infer that none of these samples had been adulterated.

RESULTS OF ANALYSES OF SUGAR.

No. of Sample.	Description.	Color.	Retail price per lb.	Water.	Ash.	Glucose.	Cane Sugar.
313.....	"A"	White	11 cts.	1.500	.036	.690	97.574
314.....	"A"	White	11 "	1.640	.721	1.000	96.639
315.....	Powdered	White	12 "	.800	.050	.000	99.110
316.....	Extra C.	Light brown	10 "	5.000	.450	4.040	90.106
317.....	Extra C.	Light brown	11 "	3.600	.664	4.578	90.856
318.....	Extra C.	Light brown	10 "	3.500	.486	3.790	92.234
319.....	Extra C.	Light brown	10 "	3.400	.486	3.836	92.478
320.....	Extra C.	Light brown	10 "	3.720	.360	7.092	88.828
321.....	Extra C.	Light brown	10 "	3.820	.918	6.250	89.012
322.....	Extra C.	Light brown	10 "	2.620	.316	2.432	94.132
323.....	Extra C.	Light brown	9 "	3.840	.432	3.690	92.088
324.....	"C"	Light brown	9 "	3.940	.612	7.092	88.356
325.....	Extra C.	Light brown	9 "	2.600	.756	3.846	92.799
326.....	X.	Dark brown	9 "	3.220	1.116	5.000	90.664
327.....	X.	Dark brown	9 "	5.120	1.170	7.692	86.018

All the samples dissolved completely in water to a clear solution.

MAPLE SYRUP.

Three samples of maple syrup were examined: two of them were found to be pure, the third, which is manufactured in Chicago, and sold in this State in cans, contained thirty-five per cent of artificial glucose.

HONEY.

Three samples of honey were subjected to examination, two were found to be pure, while the third, labelled "white clover honey," contained fifty per cent of artificial glucose.

The presence of added glucose is indicated by the turbidity produced by oxalic acid in a solution of the honey in distilled water. This turbidity is due to the presence of gypsum in artificial glucose—a substance which is not contained in pure honey.

CONFECTIONERY.

Much of the candy now made is largely composed of glucose. Indeed some of it is nearly all glucose, as for instance "taffy," the cheaper gum drops, etc. The stick candies, although formerly made of cane sugar, have recently been adulterated with glucose in some cases to the amount of seven or eight per cent.

The coloring matter used in candies is often of a perfectly harmless

nature; but in other cases mineral colors are employed, some of them poisons, as chromate of lead, Prussian blue, etc.

Of ten samples of yellow candies examined seven contained chromate of lead. In another instance terra alba was found to the extent of from ten to fifteen per cent.

Some black cough drops contained a large amount of powdered charcoal added for medicinal effect.

Respectfully submitted,
W. H. PITT, M. D.

SUPPLEMENTARY REPORT ON SUGARS.

By ALBERT L. COLBY, Ph. B.

Dr. C. F. CHANDLER,

Chairman of the Sanitary Committee:

I have the honor to submit the following report on Sugar, its adulterations, and the means used for their detection.

The adulterations and impurities of the commercial cane-sugars, were first thoroughly investigated by Hassall in 1855,* at the time of the food adulteration agitation in England. His investigations show conclusively that most of the brown sugars then in the market were unfit for use; that they contained many organic and mineral impurities, and were swarming with the sugar-mite. The white sugars were also found to be of an inferior character. The following list of adulterations and impurities were detected and reported to exist in sugars, by analysts of that time.

Organic impurities. Grape or starch sugar (glucose), potato and other starches, flour, dextrine, vegetable albumen, blood, fragments of sugar-cane, woody fibre, sporules and filaments of fungi, acarus sacchari or sugar-mite.

Inorganic impurities. Sand, particles of stone and grit, chalk (whiting), marble dust, pipe clay, terra alba, gypsum, plaster of Paris, bone-dust, lead, iron, lime, chloride of lime, common salt.

Recent investigations show that the sugars now in the market are free from the long list of insoluble mineral matter alleged to be used in former times, and that owing to the improvements in the processes of refining and purification, and the absence of raw sugars from the retail trade, most of the organic impurities previously detected are now absent, and the sugar-mite seldom seen.

Although the sugars of to-day are infinitely cleaner and practically free from foreign mineral substances, they are still subject to adulteration. The addition of starch or grape sugar (glucose) to the refined cane sugar, and the bleaching of the brown sugar by use of tin salts, are the falsifications now practiced in this important division of food.

In the present investigation 116 samples were examined. These were obtained principally from New York City as the short space of time allowed

*Arthur Hill Hassall, M.D.: Food and its Adulterations. London, 1855.

for the investigation rendered it impossible to collect samples representing the State. Care was however taken to secure the samples from different sections of the city and from all classes of stores.

The results of this examination may be briefly stated as follows :

1. *Insoluble foreign impurities.* Of the 116 samples of all kinds of refined sugars examined, 34 were classed as microscopically clean, 54 were very slightly contaminated with dust, 22 contained considerable dirt and 6 were very dirty. But in no case was there an intentional addition of insoluble mineral matters.

2. *Adulteration with glucose.* The 49 samples of white sugars examined were all found to be pure; but of the 67 brown sugars, 4 were adulterated to a large extent.

Grade of Sugar.	Number examined.	Pure.	Adulterated.
Cut loaf.....	7	7	....
Granulated.....	4	4	....
Powdered	33	33	....
"A".....	5	5	....
Total white sugars.....	49	49	....
Light Brown "extra C".....	49	46	3
Brown "C".....	10	9	1
Dark Brown "X".....	8	8	....
Total brown sugars	67	64	4
Total.....	116	112	4

This table gives a condensed record of the results of this examination. A detailed account of these results will now be given, using the classification just adopted.

I. *Insoluble foreign impurities.*

A review of recent examinations of sugar, shows, as has already been mentioned, that the sugars now in the market are free from the many alleged adulterations, such as sand, chalk, gypsum, pipe clay, terra alba, marble dust, etc.

The New York City Board of Health,* in 1871 reports the examination of sixty samples of sugar purchased at small city groceries, which were "found to be pure and unadulterated without exception." In 1881, the National Board of Health† reports the results of "an examination of 124 samples of all kinds of sugars; 57 were microscopically clean, 64 contained accidental dust, 3 were foul, and swarmed with the sugar mite."

In the present examination, a portion of the sample submitted was dissolved in water, to note the character of the solution and presence of

* First Annual Report Board of Health, N. Y. City, 1871, page 317.

† National Board of Health Bulletin, Supplement No. 6, January 1, 1881.

insoluble matters. The residues were examined with the aid of the microscope. The table gives the results of this examination.

Grade of Sugar.	Number examined.	Microscopically clean.	Slightly contaminated with dust.	Considerable dirt and dust.	Very dirty.	Solution in water.	
						Clear.	Cloudy.
Cut loaf.....	7	7	....	....	....	7	....
Granulated.....	4	1	3	....	....	4	....
"A".....	5	3	2	....	....	4	1
Powdered.....	33	8	19	6	....	20	13
Total white sugars	49	19	24	6	....	35	14
L't Brown, Ex. "C"	49	13	23	11	2	30	19
Brown, "C"....	10	1	5	2	2	4	6
D'k Brown, "X"...	8	1	2	3	2	....	8
Tot. brown sugars,	67	15	30	16	6	34	33
Total.....	116	34	54	22	6	69	47

This may be explained as follows :

1. *White sugars.* The *cut-loaf*, *granulated*, and "*A*" sugars now in the market are perfectly pure and clean.

Powdered sugar. Many exaggerated and false statements have been published, regarding the extensive adulteration of this variety of sugar. Various powdered mineral substances, such as terra alba, chalk, marble dust, bone dust, gypsum, etc., are mentioned as largely used as adulterants. No proof of these assertions can be found, however, by direct investigation of the market.

In 1873, the New York city Board of Health* made an examination of 109 samples of powdered sugar purchased at small stores throughout the city, the results of which are as follows: "45 were perfectly clean and good, 51 were very slightly contaminated with dust, 8 contained considerable dust or dirt, and 5 were very dirty; but in no case was any adulteration whatever detected."

In the present investigation, 33 samples were examined with the following results. 8 were microscopically clean; 19 were very slightly contaminated with dust, and 6 contained considerable dirt or dust. None of the samples contained intentionally added mineral matters. The dust and dirt mentioned, as found in considerable quantities in six samples, was not added intentionally; but was due to the careless handling of the sugars in the small cheap groceries from which these samples were purchased. Of the 28 samples examined, 13 gave cloudy solutions in water. This was due to the accidental presence of a very small amount of starch or flour.

Ultramarine may be generally found in powdered sugar. It is used

*Third Annual Report Board of Health, N. Y. City, 1873, page 292.

to neutralize the yellow color of the sugar, and render it a bluish white. It is harmless and cannot be regarded as an adulterant, unless present in undue excess. It was noticed in 24 of the 33 samples examined.

It may be seen from these results, that powdered sugar is not largely adulterated, as is generally supposed. The presence of the powdered mineral substances alleged as used, could be so easily detected by any consumer, on simply dissolving the sugar in water, in which these are not soluble, that it is not likely that the dealers would adopt them as adulterants, especially when other means of sophistication, which can only be detected by chemical tests, are at hand.

2. *Brown sugars.* As may be seen from the table, 67 samples of the various grades of brown sugar were examined. Of these 6 were classified as very dirty, 16 as containing considerable dust or dirt, 30 as slightly contaminated with dust, and 15 as microscopically clean. Various accidental impurities, such as rice, canary-seed, tea-leaves, coffee, paper and sticks from the barrels, etc., were found in these sugars. A few were very dirty; but in no case was there proof of an intentional addition of insoluble mineral matters.

II. *Adulteration with Starch Sugar (Glucose).*

Although, as we have just seen, the sugars of to-day are free from insoluble mineral adulterations, the use of glucose as an adulterant is practiced to a considerable extent. The results of the examination of the 116 samples for the presence of artificial or added grape sugar or glucose, is given in the following table:

Grade of Sugar.	No. examined.	Unadulterated.	Adulterated with glucose.
Cut Loaf.....	7	7	....
Granulated.....	4	4	....
"A".....	5	5	....
Powdered.....	33	33	....
Light brown, "extra C".....	49	46	3
Brown, "C".....	10	9	1
Dark brown, "X".....	8	8	....
Total.....	<u>116</u>	<u>112</u>	<u>4</u>

This table shows that the white sugars are all unadulterated. But the brown sugar (especially the light brown coffee sugar "extra C") is the variety in which this sophistication is practiced. As the table shows, of the 67 samples examined, 4 were found adulterated, and to a large extent, as may be seen by the following analyses :

No. of sample.	Character of Sugar.	Per cent of added glucose.	Per cent of total glucose.
705	Brown "C".....	22.20	undetermined
706	Light Brown "extra C".....	21.24	26.522
707	Light Brown "extra C".....	29.79	32.834
708	Light Brown "extra C".....	33.36	35.878

All colored sugars contain more or less "fruit" or "invert-sugar," which is a mixture of equal parts of dextro-glucose and lævo-glucose. This is produced from the cane sugar in the process of manufacture. The artificial glucose, used as an adulterant, is dextro-glucose made from starch.

These so called "mixed sugars," are sold in the wholesale market under certain trade names, such as "New Process Sugar," "Niagara A. B. C.," "Harlem B.," "Excelsior C.," etc., which signify to the purchaser their character. They are, however, usually disposed of in the retail trade as pure sugars. As most of these "mixed sugars" are sent to the country, they are rarely to be found in the hands of retail city grocers.

A review of other recent investigations of sugar proves the general use of glucose as an adulterant. From the six annual reports, on the adulteration of food in Canada,* the following tabular statement of results has been compiled.

Date of Report.	Number of sugars analyzed.	Genuine.	Adulterated with glucose.	Doubtful.
First Report 1876.....	15	12	3	....
Second Report 1877.....	34	30	4	....
Third Report 1878	42	34	8	....
Fourth Report 1879	101	81	9	11
Fifth Report 1880.....	55	55		....
Sixth Report 1881.....	63	63		....
Total.....	<u>310</u>	<u>275</u>	<u>24</u>	<u>11</u>

An investigation of 75 samples of sugar, made in 1879 by the Massachusetts State Board of Health, Lunacy and Charity,** shows the presence of an undue excess of glucose in 3 cases.

The recent investigation of sugars, made by Dr. Charles Smart, under the direction of the National Board of Health,† shows the very general use of glucose as an adulterant. "Among 47 brown sugars, most of which were furnished by dealers who knew that their samples would be examined, there were found 3 which contained glucose, while among 38 samples purchased for analysis, no less than 9 were thus adulterated. The glucose varied from a small admixture to 30 per cent."

The manufacture of starch sugar in the United States has sprung up entirely during the last ten years. It now ranks as an important and rapidly increasing branch of industry. The centers of the manufacture in this State are New York City and Buffalo.

In the trade, the solid products derived from the action of sulphuric acid on corn starch are known as, "Grape Sugar;" while the term "Glucose," is given to the thick syrups made from the same material. But chemically, the term "Glucose," applies to both solid and liquid forms. The varieties in the market are as follows:

1. *Glucoses.*

"Crystal H." containing about 40 per cent. glucose.

* Report on the adulteration of food, being supplement No. III. to the report of the department of Inland Revenue.

** First Annual Report State Board of Health, Lunacy and Charity of Mass., 1879, page 60.

† National Board of Health Bulletin Supplement, No. 6, January 1, 1881.

"Crystal B." containing about 45 per cent. glucose.

"Crystal A." containing about 50 per cent. glucose.

2. *Grape Sugars.*

"Brewers Grape," containing about 70-75 per cent. glucose.

"A." or "Solid Grape," containing about 75-80 per cent. glucose.

"Grained or Granulated Grape," containing about 80-85 per cent. glucose.

"Anhydrous Grape Sugar" (100 per cent. glucose) a beautiful perfectly crystalline substance, has recently been made experimentally, and patents taken out for its commercial manufacture.†

The question as to whether or not commercial glucose exerts a deleterious effect on the system, has been the subject of much discussion among scientists, especially in Germany.

In 1878 Dr. Schmitz claimed to have proved by experiments on animals that the unfermentable substances in starch sugar were positively unwholesome, even poisonous. Prof. Nessler likewise became convinced of the injurious effect likely to result from the use of starch sugar and articles containing it. Dr. Von Mering of the University of Strasburg has repeated the experiments of Schmitz and Nessler, using in the last case the identical samples of sugar and wine which had been pronounced unwholesome. He also made experiments not only on cats and dogs, but on himself and others, and comes to a conclusion directly opposite to that reached by the authorities alluded to.

The various forms of starch sugar found in commerce under the names of grape sugar, glucose, maltine, etc., consist essentially of dextro-glucose with considerable quantities of dextrine and occasionally small quantities of other materials derived from the grain. The quality varies according to the material employed, which in some cases is comparatively pure starch, and in others the whole grain; and also according to the agents employed in converting the starch, which are either barley malt, or dilute sulphuric acid with possibly a very small percentage of other acids (hydrochloric and nitric). The proportion of glucose and dextrine depends upon the extent to which the conversion is carried. The first action of the malt or acid is to produce from the starch a mixture of glucose and dextrine. By further treatment the dextrine is gradually converted into glucose.

Provided the amount of acid, other than sulphuric, be exceedingly small, and perfectly pure carbonate of lime be used for the neutralization and removal of the sulphuric acid,** there is no reason to suppose that the commercial product contains any objectional substances, unless dextrine and glucose can be regarded as unwholesome. In as much as both these substances are every-day constituents of human food, the glucose occurring in all our acid fruits, the dextrine found in every loaf of bread, and both produced by the action of saliva and other digestive fluids on all farinaceous food, there is no physiological objection to these substances.

Starch sugar, however, occupies certain physical and economic relations as compared with cane sugar, which cannot be overlooked.

*Journal of the American Chemical Society, Vol. IV, page 11.

† U. S. Patents, Arno Behr. Nos. 25,333, 250,334, 250,335, Dec. 6, 1881.

** It will be readily seen that the use of large amounts of hydrochloric or nitric acids, or an impure limestone (such as a magnesia limestone) would give rise to bitter salts which would remain in the glucose.

First. It has been estimated that starch sugar has a sweetening power two and one-half to three times less than that of cane sugar.

Second. Starch sugar sells in the wholesale market for about three and a half cents per pound, while cane sugar brings about eight cents.

Hence the mixing of this cheaper and less sweetening substance with cane sugar is not a question of a deleterious adulteration; but one of fraud. The margin in the sugar market is usually so small, and this form of adulteration so profitable, that the temptation to the refiner and wholesale dealer may be readily seen.

But on the other hand the consumer, in purchasing a "mixed sugar" for a pure cane sugar, is not only defrauded in the *amount* of sweetening power properly present in the quantity purchased, but also pays much more for the sweetness *really* present than he would have done in purchasing a *less* amount of a pure cane sugar.

METHODS OF EXAMINATION.

1. *Determination of artificial grape or starch sugar in cane sugar.*

The method of hot polarization, devised by Drs. Chandler and Ricketts,* was adopted as a means of determining the amount of starch sugar, if any, added to the samples of commercial sugars examined. This method depends upon the following well-known facts:

1. *Dextrose*, under the conditions of analysis, exerts a constant effect upon the plane of polarized light at all temperatures under 100° C.

2. *Levulose*. The action of levulose is not constant, the amount of rotation to the left being diminished as the temperature is increased.**

3. *Invert sugar*, being a mixture of one-half dextrose and one-half levulose, does not affect the plane of polarized light at a certain temperature somewhere near 90° C.† (for it can easily be seen that the constant *dextro*-rotary power of dextrose must be neutralized by the varying *laevo*-rotary power of levulose at some such temperature. The exact temperature is determined by experiment).

4. *Cane sugar*, when acted on by dilute acids, is converted into invert sugar, while dextrose is practically unaltered.

Hence, if a "mixed sugar" is heated with dilute acids, the cane sugar present is converted into invert sugar, which, with that originally present (due to the process of manufacture), is optically inactive at a certain temperature (near 90° C.), while the artificial dextrose, preserving its specific rotatory effect, will, at this temperature, show a deviation to the right in proportion to the amount present.

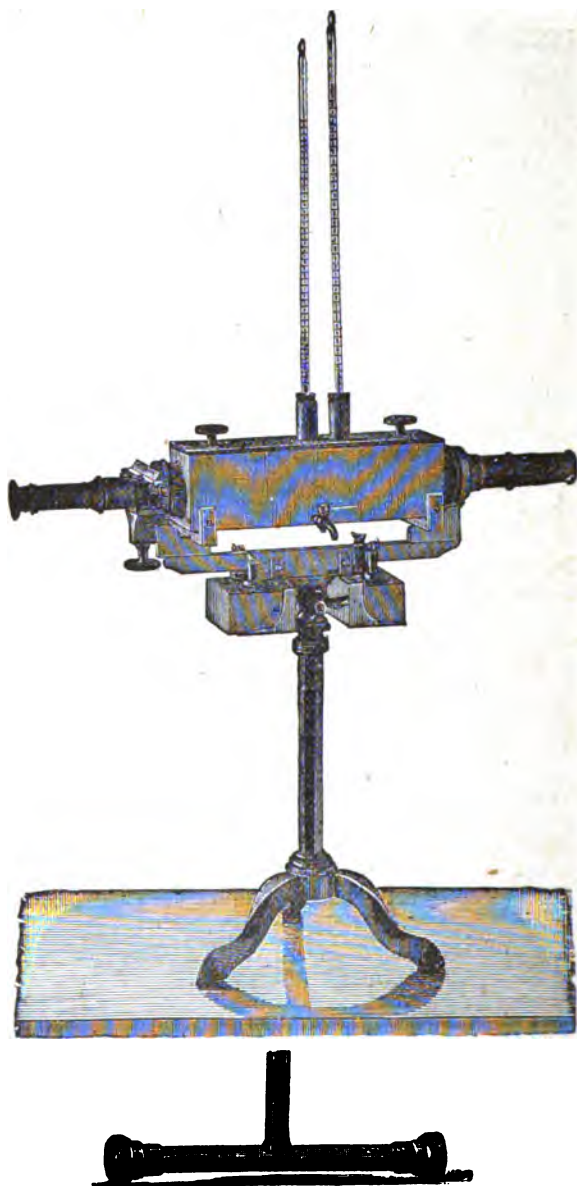
It is only necessary therefore to secure some means of heating the observation tube of the ordinary polariscope, so that readings may be taken at any temperature under 100° C. The accompanying figure shows the arrangement adopted. The middle portion of a Soleil-Ventzke Saccharometer, ordinarily intended for the observation tube alone, is so modified as to admit of the interposition of a metallic water bath, provided at the ends with metal caps, which contain circular pieces of clear plate glass. The form of the tube, for holding the sugar solution to be

* Journal of the American Chemical Society, Vol. I, page 1.

** Watts' Dictionary of Chemistry, Vol. V, page 464.

† Watts' Dictionary of Chemistry, Vol. V, page 465.

polarized, is shown in the smaller figure. It is made of platinum and provided with a tubule for the insertion of a thermometer into the



sugar solution. The end metallic caps of the tube rest on projecting shelves inside the water bath, thus bringing the tube into the center of the bath, where it is completely surrounded by water. The cover of the water bath is arranged for the insertion of a thermometer, so that the

temperatures of the water bath and sugar solution may both be ascertained. The water bath is heated from below by two or four small spirit lamps, or gas burners. The first step in using the instrument is to determine, by experiment, the exact temperature of the water bath, or sugar solution itself, at which invert sugar is optically inactive on polarized light. This will vary slightly with different instruments. For the particular instrument and thermometer used in these analyses, 86° C. was found, by repeated experiment, to be the temperature of the pure inverted sugar solution at which the reading was *zero* on the sugar scale. The temperature of the water bath was not relied upon.

The next step was the determination of the value of a degree of the scale in terms of the glucose known to be the variety used to adulterate cane sugar. It was found that the rotation to the right at 86° C. was 41°, when using a solution containing in 100 c. c., fifteen grams of a sample containing 85.476°, chemically pure glucose. Hence as fifteen grams was the amount taken, $15 \times \frac{85.476}{100} \div 41 \times 100 = 31.2719$ grams, which is the amount of chemically pure glucose necessary to read one hundred divisions on the sugar scale of this instrument; or, each division = 0.312719 grams chemically pure glucose. (A duplicate using 26.048 grams, gave as a factor 0.312488.)

Having determined the factor for a degree of the instrument, as above described, the accuracy of the method was tested by making mixtures of pure cane sugar, and known amounts of different grades of commercial grape sugar. The factor for each variety of grape sugar used, was first determined by experiment, and then from the reading of each sugar solution at 86° C., the amount of chemically pure glucose found was calculated.

The following is a tabular statement of the results:

Amount grape sugar added.	Per cent of C. P., glucose added.	Per cent of C. P., glucose found.	Difference.
1 gram in 26.048....	3.174	3.171	0.003
5 grams in 26.048.....	15.14	14.84	0.300
5 grams in 26.048.....	19.14	17.81	1.330

The success of the process greatly depends upon the care exercised in preparing the sugar solution for the polariscope. The inversion and subsequent clarification were accomplished as follows:

26.048 grams of the sugar to be examined were completely dissolved in about 75 c. c., cold water, and were treated with 3 c. c., of dilute sulphuric acid (1 to 5 by volume), on a water-bath at a temperature of about 70° C. for thirty minutes. The solution thus inverted, was then rapidly cooled, nearly neutralized with sodium carbonate solution (saturated), transferred to a 100 c. c. flask, and the gummy matters, etc., precipitated with 5 c. c., of solution of basic lead acetate.* The flask was then filled to the mark, the solution transferred to a small beaker, mixed with enough bone-black to clarify completely, and then thrown on a fluted filter. The amount of bone-black necessary depends on the grade of the sugar and consequent color of the solution. It was not

* Prepared by boiling for thirty minutes, 440 grams neutral lead acetate with 284 grams litharge, and one in one-half litres of water; diluting when cool to 2 litres and siphoning off the clear liquid.

found necessary to use, even with the lowest grade sugars, more than five grams.*

The clarified inverted sugar solution was then placed in the platinum tube of the saccharometer, the water bath filled with cold water, thermometers adjusted, and the temperature gradually raised by the spirit lamps to 86° C. This part of the operation should take about thirty minutes. If the sample was unadulterated, the polariscope reading would be zero at 86° C., while if starch sugar was present, the amount of deviation to the right in degrees and fractions, multiplied by the proper factor, and divided by the amount taken, would give the per cent. of chemically pure glucose added as an adulterant.

In previous investigations of sugars no attempt has been made to determine the amount of added glucose in adulterated samples. A determination of total glucose, by Fehling's method or otherwise, has been deemed sufficient. The amount of invert sugar naturally present being arbitrarily fixed at a certain limit for each grade of sugar examined, the sample is considered adulterated if the determination of glucose exceeds this figure. But the natural invert sugar varies in the same colored sugars within such wide limits, that this method would condemn, as slightly or somewhat adulterated, many pure sugars. The sugars made by the Scotch process for instance, in which no molasses is produced, run much higher in invert sugar than a sugar of the same color, made by a different process.

In doubtful cases the only safe method is a complete analysis of the sugar including determination of, water, ash, glucose, and cane sugar, which will add up over one hundred per cent. when the sample is adulterated, owing to the too high polarization of the cane sugar when mixed with dextrose.

II. *Determination of Total Glucose.*

This was done :

First. To obtain data for the calculation of the factors expressive of the value of a degree of the saccharometer for the different varieties of commercial grape sugar.

Second. To verify the results obtained by hot polarization of cane sugars.

After a careful comparison of various methods, the one finally selected, as affording the most concordant and reliable results was in the main that of Dr. Peter Collier, chemist to the Department of Agriculture.† The following is a description of the method:

1. *Reagents.*

Copper sulphate solution. Prepared by dissolving 69.28 grams c. p. copper sulphate, in 1 litre distilled water.

Alkaline tartrate solution. Prepared by dissolving 346 grams Rochelle salts (tartrate of soda and potash) and 80 grams caustic soda, in 1 litre distilled water.

* The bone-black used was pulverized to pass through 80 an mesh sieve, dried at 110° C. for 3 hours, and kept in a well corked bottle.

† Special report No. 33, Department of Agriculture; on Sorghum and Cornstalks, page 8-11. See also Tucker's Manual of Sugar Analysis, p. 206. Mohr; Lehrbuch der chem. anal. Titrimethode. 5th ed., 1877. p. 447. Allen; Commercial Organic Analysis. Vol. II. p. 287.

Ammonia-ferric-alum solution. Prepared by dissolving 100 grams of the c. p. salt, with the addition of 50 c. c. concentrated sulphuric acid, in 500 c. c. distilled water.

Potassium permanganate solution. Prepared by dissolving about 3.2 grams of the salt in 1 litre distilled water, allowing to settle, and decanting off clear liquid. The value of the solution in terms of glucose, was obtained by titrating against a solution of pure recrystallized oxalic acid corresponding to a known amount of metallic iron. Knowing that 1 c. c. of a solution of potassium permanganate containing 3.162 grams pure salt in a litre is equivalent to .0036 grams glucose,* all that was necessary was to calculate from these data the amount of pure salt in a litre of the solution prepared, and from this, by a simple proportion, the value of 1 c. c. in terms of glucose.

An example will make this clear: 40 c. c. of oxalic acid (equivalent to 112 mg. iron) required 20.325 c. c. potassium permanganate solution (average of three tests); hence, 1 c. c. = $112 \div 20.325 = 5.5104$ mg. iron. By formula, 10 equivalents of iron are oxidized by 1 equivalent of potassium permanganate, hence:

(10 iron = 560) : (1 potassium permanganate = 316.2) :: 5.5104 : x.

X = 3.1114 mg. pure potassium permanganate in 1 c. c. solution used, or 3.1114 grams in 1 litre.

Now as 1 c. c. of a solution of potassium permanganate, containing 3.162 grams pure salt in a litre, is known to be equivalent to .0036 grams glucose (see Mohr, reference given), we have the proportion;

3.162 : 3.1114 :: .0036 : .003542,

or 1 c. c. potassium permanganate solution is equivalent to .003542 grams glucose or invert sugar.

2. Method of Conducting the Test.

The total amount of glucose in the sample to be tested being approximately known—in the case of cane sugars, by the results of hot polarization and color of the sample, or in the case of starch sugars by the grade—a solution was made, of such strength as to contain about *one per cent* c. p. glucose. 25 c. c. of the copper sulphate solution, together with 25 c. c. of the alkaline tartrate solution were heated in a small beaker on a water bath to 75°–80° C.; 20 to 24 c. c. of the one per cent. sugar solution was added from a burette, the temperature again raised to 75°–80° C. (not above this) and the heating continued for 30 minutes. The beaker was then removed from the water bath, the suboxide of copper allowed to settle completely, and the blue supernatant liquid decanted into a second beaker, care being taken to carry over as little of the precipitate as possible. The liquor in the second beaker was then decanted into a third, and from thence passed through a small filter. The precipitate was then washed three times by decantation with about 75 c. c. boiling water, and the wash waters passed in order through the beakers and filter, care being taken to bring as little suboxide on the filter as possible. This amount of washing was found to be sufficient. The suboxide, on the filter and in the beakers, was then dissolved in about 20 c. c. of the acid solution of ammonia-ferric alum. This, diluted to about half a litre, was then titrated with the potassium permanganate solution, as usual. The value of 1 c. c. in terms of glu-

*Friedrich Mohr Lehrbuch der Chemisch-Analytischen Titrimethode, 1877, page 449

cose being known, the calculation is made from the number of c. c. used in oxidizing the reduced iron present. The following table shows the results obtained by this method on various grades of cane sugar and starch sugar.

Sample of	Experi- ment No.	cc. Sugar solut'n used.	cc. Potass. perman. used.	Percent. of c. p. Glucose.	Remarks
Cane sugar No. 626.	1	23	27.7	2.843	30 grms. of sample in 200 c. c. water.
	2	23	27.7	2.843	
Cane sugar No. 666.	1	23	32.8	3.367	30 grms. in 200 c. c. water.
	2	23	33.0	3.388	
Cane sugar No. 648.	1	23	63.4	6.509	30 grms. in 200 c. c. water. water. water.
	2	23	63.65	6.534	
	3	23	64.5	6.622	
	4	23	64.2	6.591	
Cane sugar No. 672.	1	23	68.7	10.579	20 grms. in 200 c. c. water.
	2	21	64.45	10.870	
Mixed sugar No. 706. ...	1	23	67.4	25.949	8 grms. in 200 c. c. water.
	2	21	62.9	26.522	
Mixed sugar No. 707.	1	20	53.8	32.855	2.9 grms. in 100 c. c. water.
	2	20	59.1	32.813	

Appended will be found classified references to the literature of sugar.

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GROUP VIII.

WINES, BEERS, SPIRITS AND CORDIALS.

By F. E. ENGELHARDT, Ph. D.

Prof. C. F. CHANDLER, Ph.D.;

Chairman of the Sanitary Committee of the State Board of Health:

SIR:—I have the honor to submit herewith the following report of my examinations of the group of foods assigned to me. It includes wines, beers, spirits and cordials; and although no samples of wine were submitted for examination, I have embodied in the report some general remarks on this division of the subject.

Very respectfully,

F. E. ENGELHARDT, Ph. D.

I. WINES.

By the term "wine" should be understood only pure grape juice, fermented and clarified.

Those preparations made from grape juice by other than the ordinary methods of procedure might be designated as "improved wines," to which could be added the name of the person originating the modification in manufacture.

Wines prepared artificially from raisins, cider, etc., with the addition of alcohol; coloring matter and other substances should be sold only as "artificial wines."

A good wine should be transparent; the color should not be too pale, and the taste and aroma should be pleasant. The sensation produced on the organ of taste, when drinking it, should not be for a moment, but lasting for some time, and the bouquet or aromas perceptible at once. When pouring it into a glass it should sparkle. A sour taste is always a sign of poor wine. If it quickly intoxicates we may suspect the addition of spirit, recognized by the more or less burning sensation in the throat, which is never produced by a good pure wine. Dizziness and headache are not produced by drinking pure wine. Cloudy, discolored, very highly colored wines are suspicious (Beyse's Kellerbüchlein.)

Wines are generally divided into table wines, medium wines and dessert wines, but wine experts recognize "dry wines," "greasy wines" and "cordial wines," each having three divisions according to quality:

Red Wines of the First Class.

Dry Wines.	Greasy Wines.	Cordial Wines.
Chateau Lafitte, Chat. Margaux, Chat. LaTour, Chat. Haut Brion, etc.	Romanée, Conti, Rithembourg, Clos des Vougeat, Chambertin, Hermitage 1st quality, etc.	Lachrymæ Christiæ, Cape Constantia, Messerie, Essence Chiraz, etc.

Red Wines of the Second Class.

Chat. Rosan, Chat. La Rose, Chat. Leoville, Juraneon, Bouzy, Asmannshausen, Erlau, Adels- berg, Port wine.	Voulay, Voune, Poinnard, Nuits, Beaudine, Cote Rotie, Cahorse, Benicarlo, Casais, Villany, etc.	Maccabeo, Rivisalted, Ponillour, Pedro Ximenes, Malaga, Tinto de Rota, Aleatico, Falerner.
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Red Wines of the Third Class.

Pouillat, St. Julien, Persat, Mareuil, Affenthaler, Melniker, Walporzheimer, Szegszarder, etc.	Comas, Marselle, St. George, Geory, Chassange.	The red Muscat wines of various countries, Picardan, Grenachen Minesher, etc.
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White Wines of the First Class.

Schloes Johannisberg, Leisten, Steinburg, Markobrunner, Grelsenheim, Sillery, etc.	Hermitage, Sauterne, Barsac, Mont Racher A., etc.	Commandery, Tokay Riveaultz, Canarisect.
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White Wines of the Second Class.

Scharlachberger, Brauneberger, Steinwein, Raster, Xeres, (Sherry) Gumpolds Kirchner-Austich, Vino D'Oro, etc.	Straw wine of Wurzburg, Collmar St. Peray, St. Jean, Condrieux, Madeira, etc.	Malvoidier, Monte Fiascone, Alicante, Calabrese, Ruster Ausbruch, etc.
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White Wines of the Third Class.

Laubenheimer, Markgraefer, Forster, Klosterneuburger, Rauden- wälder, Eszsmilyer, Somlauer, Ankensteiner, Czernosecker, etc.	Landirac, Pyroles, Cervus, Langre, Cosmas, Blois wine, Teneriffe.	Linel, Piccardon, Marsalla, Maccabeo, Careavelho, Villanyi, St. George Ausbruch, etc.
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(Partly taken from Beyse's Kellerbuchlein and Dr. Feuchtwanger's Fermented Liquors.)

ANALYSIS OF WINE.

The analysis of wine usually comprises the determinations of the specific gravity, alcohol, extract, sugar, acidity, ash, phosphoric acid and coloring matter in red wines.

Specific Gravity—The specific gravity should always be determined by the aid of the specific gravity bottle at a temperature—if possible—of 60 deg. Fahrenheit.

Determination of Alcohol—(a) *By distillation*.—Although alcohol may be determined in various ways, the distillation and indirect methods deserve the preference.

For distillation from 100 to 200 grams of wine are submitted to distillation in a retort or other suitable flask connected with a Liebig's condenser.* When from two-thirds to three-fourths of the quantity taken have come over, the distillation may be stopped, the distillate allowed to cool to 60 deg. F., its specific gravity taken, and from the tables the amount of absolute alcohol corresponding to the specific gravity can be ascertained. From the results thus obtained we can easily calculate the percent for the wine submitted to distillation.

* To prevent foaming of the wine during distillation, add a little tannin, and to retain the volatile acids, a little caustic alkali before distillation to the contents of the retort.

(b) *By the indirect method*—If we take a certain weight of an alcoholic liquid, containing other substances in solution and remove by heat (over a water-bath at about 75 deg. C.) the alcohol and then add distilled water to bring it up to the original quantity, we can ascertain the amount of alcohol according to the formula $D + 1,000 - D' = x$ in which D is the specific gravity of the original mixture and D' the specific gravity of the mixture deprived of its alcohol. (Balling). According to Thudichum and Dupré both methods with proper care give good results, but Dr. Elsner prefers the indirect method.

Determination of the Extract—To determine the extract directly is not only most difficult, but it requires considerable time, hence it is best to adopt the indirect method of Balling just explained. Take a certain weight of the original wine (100 grams) evaporate it on the water-bath (at 75 deg. C.) to one-fourth, fill up to the same weight at 60 deg. F. and determine the specific gravity of the well mixed liquid, at about 59 deg. F., (15 deg. C.)

By reference to the accompanying table (I) the quantity of extract corresponding to any specific gravity can be ascertained. The figures of Schultze are better for wines rich in extract, but not so accurate for light wines as those of Hager. Instead of ascertaining the extract according to the table, we may ascertain the specific gravity of the evaporated, and again filled up wine, at 19 deg. F. to the fourth decimal, and multiply the two last places in the decimals by the number 2.25, the Houdart's factor (Elsner), which will give us the result at once.

The determination of sugar. Of the various methods that may be used for the determinations of sugar in wine, I prefer the method with Fehling's alkaline copper solution. Of light white wines I take 100 grams, and of those rich in extract 25 grams, remove the alcohol by heating over a water bath, and dilute the residue to 200 c. c. with distilled water. In the preliminary test I drop the diluted wine into the boiling copper solution (10 c. c. Fehling's to 40 c. c. distilled water) till the precipitate becomes bright red, and the blue color has entirely disappeared, filter off a few cubic centimeters, and test the latter both for copper and excess of precipitant. With a little practice very good results can be obtained by this method. I always make from two to three sugar determinations, and take the average. Colored wines must be previously decolorized with bone black, or acetate of lead solution, or both. If the presence of cane-sugar is suspected I take 100 c. c. of the diluted wine, heat it with a few c. c. conc. hydrochloric acid, (C. P.) for about one hour, over a water bath at 75° C.; naturalize to alkaline re-action, fill up to 100 c. c. again, and test as before.

The optical method should be employed whenever an apparatus is at hand.

The determination of the total acid. In 100 grams of wine I determine the acid volumetrically either with one-tenth normal soda solution, or lime-water, using red and blue Litmus paper to determine the neutral point.

The determination of sulphuric acid. This determination is of great importance at present in wine analysis, and should never be omitted, since not only — as is asserted — sulphuric acid is added directly to wine, but it may be present as the result of plastering and sulphuring, or by the addition of impure glucose, copperas, or alum, the latter to lighten the color of red wines. Of white wines I acidulate 100 grams with hydrochloric acid, heat to boiling, and precipitate with chloride of barium. For highly colored wines I take C. Weigel's method. Supersaturate 100 grams of wine with lime-water, dilute to 200 c. c. filter through a dry filter, and precipitate the sulphuric acid in 100 c. c. by chloride of barium, after acidulation with hydrochloric acid.

The determination of ash. I use 100 grams of wine, evaporate in a platinum capsule over a water bath to dryness, incinerate at a low temperature, and repeat heating till the weight is constant. Addition of a little nitrate of ammonia will accelerate the burning.

The determination of cream-tartar. 200 grams of wine are evaporated to syrupy consistency, allowed to cool, and then mixed thoroughly with 5 volumes of absolute alcohol, and allowed to stand for 24 hours. Wash the separated cream-tartar on to a filter with absolute alcohol, dissolve in warm water, and titrate with normal soda solution.

The determination of glycerine. For this determination I take 100 grams of wine, discolored if necessary, add a few grams caustic lime, and evaporate the mixture. The residue is treated with alcohol of 90 per cent. filtered and washed thoroughly with alcohol, again evaporated, and the residue extracted with a mixture of alcohol and ether (100 parts 90 per cent. alcohol and 150 parts ether) filtered, and the filtrate evaporated at a very low temperature at last under the air pump. The treatment with lime and the extraction with the alcohol-ether mixture should be repeated twice.

If the phosphoric acid has to be determined, I take the ash dissolved

in nitric acid, etc., employing the well known molybdate of ammonia process.

These determinations in connection with the behavior of the wine to polarized light, are usually sufficient to decide the question whether the wine is pure or an artificial product. Where there is a question as to whether the wine is made of cider or grape juice, the lime, magnesia, silica, sulphuric and phosphoric acids should be determined in the ash. The determination of succinic and malic acids and tannin are but rarely regarded. The presence of metals, like lead, copper, zinc, tin, etc., or of arsenic and antimony is rare in wines (excepting arsenic from sulphuring with impure sulphur, or coloring with fuchsin containing it). Where present they are usually due to some negligence or carelessness of the workmen in employing utensils and vessels not properly cleaned. Their recognition, together with that of iron and alumina, offers no difficulties if a sufficient amount of material is on hand.

The sulphuring of wines. Of the so called sulphuring — the burning of sulphur in wine casks, Wartha (Jahresb. der agricult. Chem. 1880, p. 607) says: "it should only be used for the purification of musty casks and the latter afterwards thoroughly washed with pure water. But not only is sulphur now burnt in half full casks, and new wines drawn into casks in which considerable sulphur has been previously burnt, but in some places producers go so far as to bleach the so called 'Schiller-wine' completely with sulphurous acid." He also states that often when wine is bottled, sulphur is burnt in each bottle previous to filling, whereby the so called "bottle ripeness" is produced much sooner. White wines drawn off into such bottles in 1852 contained many years afterwards a considerable quantity of sulphurous acid. It is obvious that such a beverage is injurious to health.

The substitution of acid sulphite (bisulphite) of lime in the sulphuring process, introduced some years ago, (and especially employed in the preservation of cider, etc.,) requires special attention, since it is asserted that animals fed therewith, suffered from intestinal catarrh (Koenig). The presence of sulphurous acid or sulphites is recognized by heating the wine till the alcohol is expelled, adding some pieces of pure zinc, and diluted sulphuric acid (C. P.) to the residue. The gas generated should be allowed to act on paper strips moistened with lead acetate or silver nitrate, which will become blackened, when these sulphur compounds are present.

Adulteration of wine. If wine is defined to be pure fermented and clarified grape juice without any addition, then the products obtained by the following so called improvements in wine manufacture, are not wine within the meaning of the term, and should not be recognized as such. They should be sold to the public under a name indicating their origin or their method of manufacture, as plastered and fortified wines, colored wines, wines made according to Chaptal's, Gall's, Petiot's or Scheele's methods, etc.

The "Plastering of wines." This consists in the addition of calcined plaster to the unpressed grapes, or to the expressed grape juice after fermentation has commenced. Objections; first, the formation of insoluble tartrate of lime, and soluble sulphate of potash, the latter having a bitter taste and acting as a purgative even in small doses. The French Government prohibits the sale of wine having over 0.2 per cent. of

sulphate of potash. Second, the formation of acid sulphates and free sulphuric acid in wines.

Plastering of wines is practiced in Spain, Portugal and the South of France.

Fortifying wines. This consists in the addition of brandy, cologne spirit or French spirit to the wines, to increase their alcoholic strength and to stop further fermentation. Wines with more than 20 per cent of alcohol, are fortified. Especially practiced in southern Europe, Portugal, Spain, Italy, Greece, and France. Ports and sherries are almost invariably fortified.

The coloring of wine. The coloring of wine is practiced to a great extent and with various substances, either to lighten the color of a natural red wine deficient in color, or to make from white wines colored ones, or finally, to color artificial wines.

Among the substances that furnish the coloring matter for wine, the following are the most important: whortleberries, elderberries, pokeberries, privy-berries, cherries, red beets, alkana roots, black hollyhock and red poppy flowers, logwood, brazil wood, indigo fuchsin, cochineal, etc.

The identification of these various coloring matters in wine is a most difficult matter. Special investigations have been made by a number of chemists, and numerous methods proposed for the identification of these substances. Of these I shall give a few, but must refer for further information to the originals. In investigations of this kind, I deem it absolutely necessary, that the chemist has a sample of genuine wine, of the same kind as given him for investigation, that he make (personally), all the various color reactions with the genuine wine, and with wine samples colored with the various coloring matters, as given especially by A. Gautier* and Stierlin, etc., † because it is very difficult to describe the colors of the various precipitates, etc., correctly.

According to Filhol, if we add to the suspected wine ammonia till it smells distinctly, then some sulphide of ammonium, and filter, genuine wine gives a green filtrate, while artificially colored wines give a blue, red, violet, or brown filtrate.

Carpené gives the following very simple method, to decide whether a red wine is naturally, or artificially colored, which is highly recommended by Stierlin.

Take a piece of good white burnt lime, break it into two pieces, smooth the surfaces by a knife or file, and place a few drops in succession on the same spot of the smooth surface, and observe after a few minutes the color produced. Natural red wines give a yellowish brown spot; colored with fuchsin, a rose colored spot; colored with brazilwood, a rose colored spot; colored with logwood, a dark violet spot; colored with cochineal, a reddish violet spot; colored with black Hollyhock, a yellowish brown spot; colored with poke-berries, a yellow somewhat red spot. Among the colors previously enumerated, fuchsin is the most objectionable, since it may contain arsenic, and even if pure, its repeated use is dangerous to health. The method of Fallier, improved by Prof. Ritter, gives according to Stierlin exact results, and is as follows: 200 c. c., of the red wine are evaporated about one-half. after

*Analyst 1876, No. 6, p. 109; No. 7, p. 150. Ueber Weinfälschung und Weinfärbung, Bern 1877.)

(† V. Griessmayer im Chemisch. Centralblatt, 1877, P. 386 and 381.)]

cooling, put into a separating funnel (globe shaped with stopper), ammonia added till alkaline, and then thoroughly shaken; now we add pure ether and shake again. If the ether does not separate after a little while, add some more ether, etc., and wait till the liquids have perfectly separated; then let the lower liquid run out, wash the remaining ether twice with distilled water by thorough shaking, and separate the latter perfectly; transfer the ether into a beaker or small flask, attach to a Liebig's condenser, add a piece of pure white woolen knitting yarn, and evaporate the ether rapidly over a water bath. If the wine contains but traces of fuchsin the wool will be colored a rose tint.

The following method for separating fuchsin by F. König, seems to be of easy and quick execution. Pour 50 c. c. of the wine into a flask, add ammonia in slight excess till the red color is changed to a dirty green, into this mixture put about one-half gram of pure white knitting wool, and boil till all the alcohol and the ammonia are removed. The green color of the liquids during this operation gradually changes into a brownish red, and the greater quantity of the genuine wine color becomes destroyed, while the fuchsin and other anilin colors will fasten on to the wool; the latter is taken out of the liquid, washed with distilled water, and pressed out thoroughly, put into a test tube moistened thoroughly with caustic potash, (1 potash to 8 or 10 water), and under strong shaking gradually and carefully heated till all the wool has dissolved to a brown liquid; when cold, add one-half volume of pure alcohol, and pour on this mixture carefully, an equal volume of ether, shaking at first gently and afterwards strongly. In a few moments the ether, with some of the alcohol, collects over the brown lye; pour the ether into a test tube and add a drop of acetic acid, which will produce a red color if the least trace of fuchsin was present. Violet and blue anilin colors can be separated and recognized in a similar manner.

Improvement of Wines. The method of Chaptal for improving wines, consists in the addition of sugar to the expressed grape juice before fermentation, to increase the alcoholic strength, and of marble dust, etc., to neutralize the excess of acid. The process was first recommended by the French minister Chaptal, in 1801. It is used especially in France in bad wine years, to produce the fine Burgundy wines; and it is said to be well adapted for fine bouquet wines, whose characteristic properties are not injured but rather improved thereby.

Dr. Gall's method consists in the preparation of a normal must with 0.5 to 0.6 per cent. of free acid, and 22 to 24 per cent of sugar. If the must contains, for instance, from 1.0 to 1.2 per cent free acid, it is mixed with an equal quantity of water, and the necessary sugar added to bring it up to the required standard. Employed especially in Germany in bad wine years, and for unripe grapes.

The method of Petiot of improving wine and especially of increasing its quantity from 100 to 500 per cent dates from 1852. In the year Petiot produced from a certain quantity of grapes instead of 7,200 quarts no less than 34,200 quarts. First: by adding to the expressed juice an equal volume of sugar water, containing the same amount of sugar as the expressed juice. Second: to the remaining pulp of the grapes he added a new quantity of sugar water with eighteen per cent of sugar, and fermented it for three days. The latter experiment he repeated three times in succession with the same pulp, and sugar solutions, with from twenty-

two to twenty-three per cent of sugar, obtaining thus after fermentation as he says "wine in the full sense of the word."

These infusion wines resemble, according to Thudichum and Dupré "natural wines in all essential qualities; they contain all the essential ingredients, and almost in the same proportions as the natural product." The value of Petiot's method to the wine producer, especially in unfavorable seasons, cannot be over estimated, since wine made after this method is ready for bottling in four months instead of two or three years as with the natural wines; it requires little or no care, and almost no fining. These artificial wines are aromatic, retaining "the perfect bouquet of the natural ones." They are not subject to disease like the natural wines, and possess a most remarkable stability. In case the grapes contain an insufficient amount of acid for the several infusions, tartaric acid or cream tartar is added, and tannin for red wines; also mallow flowers or whortleberries to the pulp before fermentation and alum to the wine to lighten the color. Infusion wines are produced in large quantities in Europe, especially in France.

Scheele's method, said to be practiced by wine dealers in England, Germany, and Austria, consists in the addition of from one to three per cent of glycerine to the wine, whereby the wine if young appears older, and has more body and stability.

To increase the stability of wine, salicylic acid has been introduced successfully within the last few years. How far these last two additions to wine may be injurious to health is an unsolved question as yet.

To what extent these various wine improving methods just enumerated are practiced on European wines exported to this country, and to what extent on our own native wines, I am unable to state.

ARTIFICIAL WINES.

The manufacture of artificial wines from raisins, cider, sugar, alcohol, glycerine, tartaric acid, cream tartar, coloring matter, wine flavors, and water is no secret in Europe, nor in this country. Manufacturers of flavoring extracts, ethers and essences, usually give the necessary receipts with their wine flavors, of California, Catawba, Claret, Malaga, Madeira, Muscat, Port, Rhine, and Sherry. I might give a great many of these receipts but the following few may suffice: "Dissolve in a suitable vessel twenty-five pounds of grape sugar, and one-half pound of tartaric acid in twenty-five quarts of hot water, to which mixture add seventy-five quarts of cold water, and fifty pounds of grape pulp; stir well, cover, allow to ferment four or five days, stirring it occasionally, then press, and transfer to a barrel in the cellar and treat as other wine."

Port wine — Thirty gallons cider, (fermented) five gallons spirit, four gallons syrup, $\frac{1}{4}$ pound powdered gum kino, $\frac{1}{4}$ pound tartaric acid, six to eight ounces Port wine flavor. To produce a better quality add either a few gallons German cherry juice, or any kind of pure wine, Spanish or Catalonic the best.

Another — Ten gallons hard cider, one gallon whortleberry-juice, two gallons elderberry juice, one pound essence of port wine, two gallons of sugar syrup, ten gallons pure spirit, ten gallons soft water.

Bordeaux or Claret Wine — "To a decoction of one pound orris-root in five gallons of water, add one gallon of raspberry juice, ten gallons pure spirit, $\frac{1}{4}$ pound essence of claret, one gallon sugar syrup and the coloring produced from cochineal."

Muscat Wine — "Digest in ten gallons of white wine, fifteen pounds of large raisins, fifteen pounds currants, and add four gallons of white sugar syrup, and one dram of *oil of vitriol*. Let the whole mixture digest and ferment for some days, the clear liquor is then drawn off, and allowed to finish in the barrel till it is perfectly clear; then add one-half pound essence of port wine, one gallon of whortleberry juice, ten gallons of pure spirit and five gallons of water.

London Cherry — "Chopped raisins, 400 pounds, soft water, 100 gallons, sugar forty-five pounds, cream tartar one pound, cider, sixteen gallons, let the liquor remain in a closed vessel for one month stirring it frequently; then add of spirits eight gallons, wild cherries bruised eight pounds, let stand one month longer, and fine with isinglass."

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II. LIQUORS.

Liquors are sugar solutions fermented and then distilled, hence they are also called distilled spirits.

Liquors may be divided into the following three classes:

1. Simple liquors.
2. Compound liquors or double spirits.
3. Cordials, or liqueurs.

To the latter class we may add the so called bitters, essences, elixirs, crèmes, ratafias, punch essences, etc.

Simple liquors are, as already stated, fermented and subsequently distilled and rectified, sugar solutions. Hence their main constituents are water and alcohol, with small quantities of volatile substances usually formed during the process of fermentation of the sugar solution; as fusel oils, volatile acids, alcohols, ethers, aldehyde, etc., Tannin and coloring matters, when found in these liquors should only be due to the wood of the casks containing them.

The sources of liquors are many fold, thus we may prepare them:

First: From liquids containing alcohol (previously formed by fermentation), by distillation and rectification; cognac brandy from wines, cider brandy from fermented cider, etc.

Second: From liquids or solids containing sugar; by fermentation, distillation, and rectification. From the juice of beets, carrots, sugar-cane, cherries and prunes; from molasses of cane and beet sugar manufacture; from the marc of grapes, and residues of wine manufacture; from whey, etc.

Third: From substances which contain neither alcohol nor sugar, but the constituents of which may be converted into sugar and dextrose, as potatoes, rye, oats, barley, wheat, rice, buckwheat, etc.

Among the simple liquors the most important ones are cognac brandy, whiskey and rum.

COGNAC BRANDY.

Cognac brandy in the proper acceptance of the word, and thus it should be defined by law, is the distilled spirits of wine, containing therefore only the volatile constituents of wine, a little coloring matter from the cask and a trace of tannin from the same source. It is mainly produced in the south of Europe and especially in France in the district of Deux Charentes. Its name comes from the town of Cognac in the above district. From seven to twelve gallons of wine yield only one gallon of brandy—"eau de vie supérieure" as it is called in France. In regard to the color of brandy, a late writer in the Science Monthly states: "Cognac brandy is at first a colorless liquid, but it gradually acquires a pale yellow or amber color from the cask in which it is kept for aging. It never appears with its natural color however, public taste having become vitiated to the extent of requiring a rich brown or brandy color, which is imparted by a mixture of caramel or burnt sugar. Occasionally, too, a little red sanders wood (*Pterocarpus santalinus*) is used for coloring." The alcoholic strength of French Cognac brandy varies from about forty-eight to sixty per cent by volume, but is usually about fifty-five per cent. The quality of brandy, and consequently its price (and this is true of all other liquors), does not depend on the alcoholic strength of the liquor, but on its bouquet (aroma), and its taste, both of which are greatly improved by age. The various "brands" are produced by the large commission merchants, by mixing, or blending as it is often called, the different varieties of spirit, purchased from the distillers.

The so-called "eau de vie de marc," an inferior brandy, is partly produced from the dark red wines of Spain, Portugal, etc., and partly from the manes or refuse of grapes, the scrapings of wine casks, and the so-called lees, deposited from wine by keeping. This Cognac usually contains some fusel oil, derived from the skins of the grapes, to which is due its more fiery taste as compared with the genuine Cognac brandy.

Although I have carefully examined the chemical journals and books at my command, I have found only a few analyses of brandy, which give the alcoholic strength, the specific gravity of the liquor, its extract and ash.

Analyst.	Specif. Gravity.	Vol. per cent. alcohol.	Weight per cent.	Extract per cent.	Ash per cent.
Dr. J. König *.....	0.8987	69.5	61.7	0.645	0.009
H. Grouven *.....	0.8987	55.0	47.3	0.645	0.009

* Nahrungs und Genussmittel, Erster Theil, page 187; and Zweiter Theil, page 469.

Prof. J. F. Babcock* from 35 to 57.5 per cent by volume; lowest and highest percentage in eighty-one determinations.

METHODS OF ANALYSIS.

In the analysis of ordinary liquors, like cognac, rum, whisky, or gin, the main quantitative determinations are the specific gravity, the alcohol, the solid residue, and the ash. These determinations offer no difficulties. The *specific gravity* may be determined either by the pycnometer as described under wine, or with a good specific gravity hydrometer at a temperature of 60° F. The *alcohol* determination can be made in a number of ways, as stated under wine, though I prefer the distillation method as described there.

Since the liquors mentioned above are usually sold by measure, and according to the indications of the United States custom house hydrometer, and since, moreover, the government collects its revenue according to its indications, I deem it but proper that the alcoholic strength of these liquors should be stated as found by that instrument.

For the *solid residue* a small quantity, about 50 grams or c. c., should be evaporated over the water bath to dryness in a platinum capsula, till a constant weight is obtained. By incinerating the residue the ash is obtained. The latter may be dissolved in acid, etc., and serve for determining the presence of metals, as copper, lead, etc.

The *acidity* of pure liquors is usually due to a little acetic acid, and it has been asserted that all genuine cognacs or brandies are acid. The quantity may be determined, if no other acid is present, as described under wine, with 1-10 normal alkali. Tannic acid, derived from the casks, is recognized by giving precipitates with metallic salts, gelatine, etc. Quantitatively it may be determined in several ways, but, preferably Wagner's method, as improved by J. T. Clark. (Am. Chemist, Aug. 1876, p. 44.)

Fusel Oils.—The presence of fusel oil is best ascertained by placing in a small white porcelain dish, 10 c. c. of the suspected liquor, previously decolorized by bone black (properly purified and reburnt.) Now drop into the liquor about 5 drops of the officinal hydrochloric acid c. p., and then about the same number of drops of freshly distilled, and perfectly colorless oil of anilin. If only a minute trace of fusel oil is present, the drops of the anilin, as they sink to the bottom of the dish, will soon become slightly tinged with a rose color. The intensity of the color increases with the quantity of fusel oil present. Of all the tests for fusel oil with which I am acquainted this is the most sensitive one, and it will indicate the presence of fusel oil when all others seem to fail. The best known and the most ready method to apply, is testing for fusel oil by the smell, either by rubbing the suspected liquor between the palms of the hands, and to smell as soon as the alcohol is evaporated

* Prof. James F. Babcock, in his first and second annual report as State Inspector and assayer of liquors to the Commonwealth of Massachusetts, Boston 1876 and 1877.

M. U. Green, Ph. D., (American Chemist, volume VII, No. 2, page 46) found "pure grape brandy" wholesale price \$6 per gallon, dark amber color, neutral reaction, pleasant but sweetish taste, and odor of the grape. Alcohol 43.8 p. c. by weight; fusel oil, a trace; color of oak; oil of wine; solid residue, .042, p. c. saccharine, with traces of potassium and sodium acetates.

"French brandy," sold at eighty cents per pint, dark amber color, acid reaction, odor and taste of plain grain spirit. Alcohol 45.4 p. c., by weight, fusel oil very slight trace; acetic acid 0.002 p. c.; tannin a trace; solid residue 0.005 p. c.,

"Apple Brandy." Alcohol 44, 4 p. c. by weight; acetic acid 0.002 p. c.; potassium and sodium chlorides, a trace; capsicum appreciable in the residue; solid residue very slight; no prunic acid.

from the hands, or by pouring the liquor into a glass and then returning it to the vessel; as soon as the alcohol has evaporated from the bottom and sides of the glass, the smell of fusel oil, when present even in very small quantities (1-10 of a per cent.) can be easily detected by an expert. For the quantitative determination of fusel oil I must refer to Trescott's "Chemical Examinations of Alcoholic Liquors."* My opinion is, that if liquors contain fusel oil to the extent that it is readily perceptible by its odor, such liquor is a suspicious article, although it may be genuine; and it should not be sold as a beverage until it has undergone a new rectification through a charcoal filter.

When fermented saccharine liquids are submitted to a distillation, we obtain, as previously stated, besides water and alcohol (common or ethyl alcohol), small quantities of other alcohols and volatile fatty acids, which constitute what is usually known as fusel oil. All raw material used for the preparation of a distilled liquor has its own peculiar fusel oil. Hence we have a potato fusel oil, a sugar beet fusel oil, a rye fusel oil, a corn fusel oil, a grape fusel oil, etc., which contain in various proportions propyl, butyl, amyl alcohol, etc., and the corresponding acids, propylic, butyric, valerianic acids, etc. During the ageing of the liquors, the constituents of the fusel oils gradually act upon each other, producing new combinations, known as ethers, which impart to the liquors their peculiar bouquet or aroma, as acetic ether, butyric ether (pine-apple essence), oenanthic ether (Hungarian wine oil), pelargonic ether (finest cognac oil), acetate of amyl (pear oil), valerianate of amyl (apple oil), etc. Hence the greater the age of a distilled liquor, the more of the constituents of the fusel oil disappear, and the finer becomes the aroma of the liquor in consequence of the formation of these ethers.

Fusel oil is a poison, and the most poisonous constituent in it is the so called amyl alcohol (especially large in the fusel oil of potatoes). Dajardin (see *Chemisches Centralblatt* für 1880, p. 172) arranges the genuine liquors in the following order, according to their poisonous qualities, commencing with the least injurious.

1. Cognac from wine (containing only traces, if any, of amyl alcohol).
2. Cognac from perry.
3. Cognac from cider and wine tresters.
4. Whisky from sugar beets.
5. Whiskies from the various grains.
6. Whisky from sugar beet molasses.
7. Whisky from potatoes.

* Rabateau deduced from experiments with frogs (L, Union 1870, 90; Schmidt's *Jahrbuecher der Gesamt. Medicin.* B. 149, p. 264) that amylic alcohol produces poisonous effects closely resembling those of ethylic alcohol, but of fifteen times greater intensity. The frogs were floated in a 0.002 solution of the alcohol (1 part to 500 parts of water), and then in stronger solutions, and the effects of depressed action of the heart, congestion, anaesthesia and death were timed. Amylic alcohol produced the same effects in the same times as did ethylic alcohol of fifteen times greater concentration, or butylic alcohol of three times greater concentration. From which it is inferred that, the poisonous action of butylic alcohol is five times more intense than that of ethylic

* See also: "Wieder die Nahrungsfälscher. Organ des Untersuchungsamtes für Lebensmittel, etc., Hannover. Heft. 12, 1881 p. 184.

alcohol in the same quantity. Rabuteau also experimented with himself by taking 0.25 to 0.50 grams (4 to 8 grains of amyl alcohol) in a glass of wine, and the results confirmed the conclusions given above."

"On the other hand, observers of cases of delirium tremens and acute alcoholism, have not found it more likely to result from the use of cheap grades of spirits with much fusel-oil, than from the purer and stronger grades." (Alcoholism in Russia, Hermann. Prescott "Chemical Examination, etc.," page 18.)

From the facts and statements just quoted it is evident that the worst and most injurious ingredient in our so-called strong or distilled liquors is the alcohol itself, and next come the fusel-oils. These latter we can remove almost entirely by a proper rectification, and the law should require their removal as far as possible from all liquors, * while the quantity of the alcohol should also be regulated by law, since from numerous investigations, including my own, it is evident that the amount of absolute alcohol in 100 per volume, varies in the various simple liquors from 60 per cent to almost 25 per cent, the lower, the better for the health of the consumer.

Coloring and astringent matters, due to the oaken casks in which liquors are kept, are generally found in such very small quantities in genuine liquors that we can usually neglect their determination, beyond proving their presence in the solid residue, as previously indicated. The same, is true of the determination of tannic acid. Attention has been already called to the fact that genuine brandies are colored artificially with caromel and red sanders wood.

ARTIFICIAL BRANDIES AND ADULTERATION OF BRANDY.

Dr. Edward Smith of England, (in Foods 1873), says: "Brandy is or should be the choicest and most agreeable member of the class of ardent spirits. It should be prepared by distillation from wine. * * * A very large proportion of the brandy consumed all over the world is, however, made with little or no wine, and is simply alcohol distilled as in the preparation of whiskey, and colored and flavored with oil of cognac. A very large quantity of common fiery potato spirit is sent to France from Germany to be redistilled, and forwarded to us as French brandy, whilst various qualities of spirits are made in this country into British brandy."

"Brandy is as colorless on distillation from wine as alcohol distilled from malt, and can readily be colored by adding burnt sugar. Its flavor is due to volatile oils and oenanthic ethers, the nature of which has not been determined, but some are derived from the distillate, and others are produced in the process of distillation, and by age."

"It is therefore evident that brandy differs from whiskey and other moderately good spirits only in the flavors which it possesses, and the inferior kinds are in no degree superior to them. Perhaps there is no preparation used as food or medicine in which there is so great a variation in quality, whilst at the same time the changes are due to subtle substances, but little known to the wisest, and inappreciable by the unrefined and untutored taste"—(page 381 and 382).

Prof. James F. Babcock says, on page 9 of his First Annual Report

* The Congress at Paris against Alcoholism decided that, fusel oils in liquors should be considered as injurious, and that the sale of liquors containing these substances should be prohibited.

as Inspector and Assayer of Liquors: "Much of the brandy imported into this country is, according to good authorities, prepared from corn spirit, flavored to imitate brandy and colored by means of burnt sugar. It is said that corn spirit is largely imported into France to be used in the adulteration of French brandy."

"What is known as British brandy consists for the most part of corn spirit flavored. The flavor is accomplished by the addition of a little genuine brandy, but more frequently, according to Dr. Hassal of London, 'by distillation of the marc, the name given to the refuse skins and pips of the grape left after the distillation of the wine.'"

"By distilling British molasses over these lees, says another authority, 'the manufacturer obtains, to some extent, the peculiar flavor which characterizes French brandy.'"

Professor Babcock in his Second Annual Report (page 15), says: "Almost all whiskies, brandies and 'old' rums are artificially colored by the addition of caramel or burnt sugar. This custom has become so general that it can scarcely be called an adulteration; the caramel is harmless and is used only in small quantities."

"Brandy is chiefly adulterated by the addition of water or spirit, or is produced artificially by the use of oil of cognac, an essential oil derived from the lees of wine, and to which in part brandy owes its bouquet."

Muspratt (New Encyclopaedia of Chemistry, p. 67), says: "British brandy, British gin, whiskey or rum are produced from corn; French brandy, from wine; West India rum from sugar or molasses. The same author says (p. 111): "The brandy sold in England is, for the most part artificial—the fabrication of the rectifying distiller."

The following recipe for artificial brandy is given by Dr. Ure: "Dilute the pure alcohol to proof pitch, and add to every hundred pounds weight of it from half a pound to a pound of argol—crude wine stone—dissolved in water, some bruised French plums, and a quart of cognac. Distil this mixture over a gentle fire in an alembic provided with an agitator. The addition of brandy and argol introduces cœnanthic ether, and if a little acetic ether be added to the distillate, the whole imparts the peculiar taste of genuine cognac brandy; color with burnt sugar if necessary, and add a little tannic acid to impart astringency. 'This brandy' he says, 'may be reckoned as wholesome as alcohol in any form can ever be.'"

Prof. Parrish thinks "we might make brandy for ourselves, as there is no merit in having it imported. We should set about substituting the variable uncertain adulterated brandy of commerce by a definite liquor of the same alcoholic strength as the standard specimens."

In 1875, Prof. Albert Prescott stated that "artificial brandy is a grain spirit, with addition of substances which are characteristic constituents of a grape spirit. It may be made more or less nearly identical in composition with veritable brandy. Fictitious brandy is a grain spirit with additions which make it resemble a grape spirit in flavor and odor, rather than in composition. A substitution for brandy is a grain spirit (in most cases), not modified to approximate grape spirit, but merely presented as such. The term, brandy, as used in commerce without qualification, must be held by common consent to include artificial brandy. ('Chemical examination of alcoholic liquors,' page 21). On page 23 he quotes the following formulas for the manufacture of brandy, etc.: 'Brandy essence'—15 parts of acetic ether, 12 parts of spirit of

nitrous ether, 1 part of rectified woodspirit. 'Brandy essence'—5 parts of oil of grapes, 4 parts of acetic ether, 1 part of tincture of allspice, 3 parts of tincture of galls, 100 parts of 'alcohol.' Take 1 part of either of these 'brandy essences,' to 1,000 parts of 'alcohol,' with 600 parts of water; or, 2,500 to 3,000 parts of 80 to 90 per cent alcohol, 1,700 to 2,000 parts of water, 10 parts of spirit of nitrous ether, 5 parts of tincture of allspice, 1 part of acetic ether, 2 parts of tannic acid. (The spirit of nitrous ether contains 5 per cent or less of ethyl-nitrite.) A London 'brandy improver:' acetic ether, oil of capsicum, sugar, and caramel; the oils or tinctures of cassia and cloves, and oil of bitter almond are used."

Dr. G. B. Wood, in his work on Therapeutics, remarks, "that there is little or no difference between brandy, rum and whiskey, in relation to the effect of the alcohol; that medicinally, it is of but little importance; that the different forms of ardent spirits are now prepared artificially, by first obtaining rectified spirit free from fusel oil, then reducing this with water to the requisite strength, and finally giving the desired color and flavor by suitable additions."

Prune tincture used in the preparation of English brandy is made according to Muspratt (page 106) by covering fifty-six pounds of prunes, thoroughly broken up, with twenty gallons of clean spirit of wine, and after being allowed to stand for eight or ten days, rack off; the refuse fruit is washed twice with liquor, and the residue is then thrown away.

He adds, "many rectifiers, prepare a brandy flavor as follows: To one hundred gallons spirit—clean faints, fifty-four over proof—add 100 gallons of good strong vinegar, four gallons of spirit of nitre, in a tank, and mix the whole thoroughly, cover closely, and the next day run it into the still with 8 pounds of nitric acid, 10 pounds of almond cake, 5 pounds of orris root, and two pounds of lemon peel; work the still slowly, and turn off at proof strength. In making up brandy, ten per cent. of the above flavoring is employed, but more or less may be used to suit the taste of the consumer."

Cognac brandy according to Dr. Feuchtwanger, "may be produced from the best cognac or grape-oil, the ænanthic ether, the extract of grape juice, the essence of cognac or brandy flavoring from cognac oil, or the ænanthic ether; dissolve one ounce of the best cognac oil in one quart of the highest proof alcohol, and let it stand over night; the following morning add one ounce of acetic ether, one ounce oil of apple, one ounce of essence of Jamaica rum, and ten drops of the oil of bitter almonds to the alcohol; and in the cask containing 160 gallons of good proof spirits, rectified by the above prescribed method, add one gallon of syrup of gum arabic, and according to the color desired, either dark or pale brandy, one gallon of sugar coloring and one quart of the tincture of white-oak bark. From the essence of cognac, for sixty gallons of pure spirits, take one pound of the essence of cognac, one gallon of syrup of gum arabic, one gallon of sugar coloring, one quart of oak-bark tincture, one ounce of acetic ether. From the extract of grape juice; one pound of the extract of cognac, one gallon of syrup of gum arabic, two gallons of sugar coloring, 200 gallons of pure spirits. From brandy flavoring; each gallon of the brandy flavoring is put into a barrel (of 40 to 45 gallons capacity), of pure spirits (French purified spirits), and according to the color desired from one-half to one gallon of sugar coloring is added. To add, if it is desired, about five gallons of

pure imported brandy for each barrel containing the mixture, a more expensive, and perhaps also a more improved brandy, may be thereby obtained.

The Rochelle brandy is imitated by the extract of cognac: say one pound to five barrels of pure spirits, as above described and adding sufficient coloring; one-half pound essence of violet, one gallon of syrup of gum arabic, one quart of tincture of oak bark, and two gallons of Rochelle brandy for each barrel."

Ed. Schuberts practisches Recepttaschenbuch für Destillation (1877) and A. Rion sämtliche Geheimnisse der Bierbrauerei, give the following receipts:

"Cognac (ordinaire): for thirty quarts take, twenty quarts of rectified spirits of 90° Tralles, one-tenth ounce violet flower essence, five ounces raisins, ten ounces cognac essence, ten quarts water, and six ounces St. John's bread. Mix the spirit with the essences, and boil the raisins and St. John's bread in the water, filter, and mix all together, color finally with caramels."

"Cognac (fair): for thirty quarts 60° Tralles: fifteen quarts rectified alcohol 90° Tralles, seven and one-half ounces cognac essence, one-tenth ounce violet flower essence, seven and one-half quarts genuine cognac, five ounces raisins, six ounces St. John's bread, seven and one-half quarts water; prepared as the previous one."

Cognac (fine): for thirty quarts 60° Tralles: eight quarts rectified alcohol 90° Tralles, eighteen quarts genuine cognac, five ounces cognac essence, two ounces raisins, two ounces St. John's bread, one-tenth ounce violet flower essence, four quarts water, prepared as before."

W. B. Dick gives in his "Encyclopedia of practical Receipts and Processes," the following information on the manufacture of imitation brandies. Flavoring used for the manufacture of cognac brandy, etc. "Prune flavoring. Mash twenty-five pounds prunes, infuse for fifteen days with six gallons proof spirits, stirring it every day, and filter. Raisin flavoring. Subject twenty-five pounds mashed raisins to the same process as the prunes in the last recipe. St. John's bread flavoring. Cut fifty pounds St. John's bread into small pieces, infuse for fifteen days with twelve gallons proof spirits, stirring every day; filter."

"How to prepare essence of cognac. Take one ounce oil of cognac — the green oil is the best; put in one-half gallon ninety-five per cent. spirits; cork it up tight, shake it frequently for about three days; then add two ounces strong ammonia. Let it stand three days longer; then place in a stone jar, that will contain about three gallons, one pound fine black tea, two pounds prunes, having first mashed the prunes and broken the kernels. Pour on them one gallon spirits, twenty above proof. Cover it close, and let it stand eight days. Filter the liquor, and mix with that containing the oil and ammonia. Bottle it for use. This makes the best flavoring known for manufacturing brandies or for adding to such cordials, syrups, etc., as require a fine brandy flavor." (Monsert.)

To imitate brandy with essence of cognac. Take one pint essence of Cognac fifteen gallons pure spirits (very fine) twenty per cent. above proof, one-half pint plain white syrup. Color with caramel.

"Highly flavored domestic brandy. To forty gallons French proof spirit add two quarts raisin flavoring, two quarts prune flavoring, two quarts St. John's bread flavoring, one gallon best Sherry wine, two

drachms oil of cognac and twenty drops oil of bitter almonds, both dissolved in a little ninety-five per cent. alcohol; one gallon Jamaica rum (or one-fourth ounce Jamaica rum essence) and two pints wine vinegar. Ten gallons of this mixture mixed with thirty gallons French spirits, makes an excellent domestic brandy and one pound of glycerine gives it age.

Imitation Cognac brandy. "To thirty-six gallons French proof spirits add four gallons Tellevoisin or Marette Cognac, one-half gallon best Sherry or Madeira wine and twenty drops oil of Cognac, dissolved in a little ninety-five per cent. alcohol. Then pour two quarts boiling water over two ounces of black tea; when cold, filter through flannel and add a little maraschino; mix this with the other ingredients and color whole with caramel."

"Another excellent formula is as follows: Dissolve twenty drops oil of cognac and fifteen drops oil of bitter almonds in a little ninety-five per cent. alcohol; add it to forty gallons, sixty per cent. French spirit, with two pints tincture of raisins, two pints tincture of prunes, three pints best Jamaica rum, three pints best Sherry wine and one-half ounce acetic ether; color with caramel.

Imitation brandy. Take forty gallons French spirits, add to it one pint tincture of raisins, one quart prune flavoring, one-half gallon best Sherry or Madeira wine, and one pint wine vinegar. Then add one drachm oil of cognac, twelve drops oil of bitter almonds, one-eighth to one-half drachm tannin powder, each dissolved separately in ninety-five per cent. alcohol. Color to suit with caramel.

Imitation French brandy. To forty gallons French proof spirit add one quart tincture of orris root (infuse two ounces powdered orris root for twenty days in one quart ninety-five per cent. alcohol; filter), one pint vanilla flavoring (infuse one drachm sliced vanilla for twenty days in one pint ninety-five per cent. alcohol; filter), one-half gallon best Sherry or Madeira wine, and one pint wine vinegar. Dissolve separately, one drachm oil of cognac and twelve drops oil of bitter almonds each in a little ninety-five per cent. alcohol, add them to the mixture, coloring the whole to suit, with caramel.

Imitation pale brandy. Infuse one drachm star anis (breaking the star only) for eight hours in one-half pint ninety-five per cent. alcohol, and filter; add this to forty gallons proof spirits; then add one-half gallon best Jamaica rum, and one pint of the best raspberry syrup. Dissolve one drachm oil of cognac and twelve drops oil of bitter almonds, separately, in a little ninety-five per cent. alcohol, and mix them with the whole.

In "Secret Wealth," compiled by Watson Johnson, Syracuse, 1875, among others, the following receipts are given:

"French brandy," pure spirits, one gallon, best French brandy one quart, loaf sugar two ounces, sweet spirits of nitre one-half ounce, a few drops of tincture of catechu or oak bark to roughen the taste if desired. (Page 99.)

"Pale brandy," the same only using pale brandy instead of French, and one ounce of tincture of kino for every five gallons.

"Cognac brandy."—To every 10 gallons of pure spirits add two quarts New England rum or one quart Jamaica rum and from 30 to 40 drops of oil of cognac cut in one-half pint of alcohol; color with burnt sugar.

"Brandy."—To 40 gallons of pure neutral spirits, add one pound of

crude tartar dissolved in one gallon of hot water; acetic ether one-quarter pound, bruised raisins six pounds, tincture of kino 2 ounces, sugar three pounds, color with sugar coloring; let stand for 14 days and then draw off.

The following recipes, etc., have been taken from the price-list of a manufacturing establishment (cognac oils, essences, ethers and flavoring extracts.)

"To produce a good imitation of cognac, a good cologne spirit, which is double-distilled and rectified and therefore entirely free from fusel oil, should be used, though other spirits and whiskeys will answer the purpose, but will not yield as good a quality."

"Cologne spirit is made as high as alcohol, say 188 per cent. and must be reduced with distilled or rectified water; it is however sold by distillers at any proof required."

"Neutral or proof spirit, which is made by re-rectifying the double-rectified whiskey, is next best to cologne spirit for brandy, etc. Double-rectified whiskey is used for imitation Rye, Bourbon or Monongahela whiskey, bitters, New York gin and New York brandy, but reduced, alcohol should never be used. All manufactured liquors will improve by age; as a substitute for age, it will be found of great advantage to cut the oils and essences well in alcohol and to keep them in air-tight jars as long as possible."

"Cognac, from our finest cognac oil, distilled from grapes; take, to 40 gallons of the best cologne spirit proof, one-sixth of one oz. of the cognac oil, well cut in one pint of alcohol one and one-half pint sugar syrup and four oz. of our sugar coloring."

Brandy, from oenanthic ether; 4 oz. oenanthic ether, one oz. Jamaica rum essence, one and one-half pint sugar syrup and 4 oz. of our sugar coloring.

Rochelle brandy 4 ounces of essence to 40 gallons of proof spirits.								
Otard	"	4	"	"	40	"	"	"
Cognac	"	4	"	"	40	"	"	"
Signette	"	4	"	"	40	"	"	"
Catawba	"	8 to 10	"	"	40	"	"	"
Apple	"	6	"	"	40	"	"	"
Cider	"	8	"	"	40	"	"	"
Peach	"	5	"	"	40	"	"	"
Cherry	"	8	"	"	40	"	"	"
Rice	"	1 pound	"	"	50	"	"	"

and one pint of sugar syrup.

In this connection I may be permitted to give the preparation of the so-called wine oil, Hungarian wine oil, or cognac oil. As early as 1852, H. Schwartz, in Breslau found that an essence sold under the name of Ungarwein oil and used for the manufacture of cognac, consisted mainly of oenonthic ethyloxide, (Wagner's Jahresbericht der chemisch. Technologie, 3. Jahrgang, 1857, p. 320) A. Rauter gave in the same year the following information in regard to the manufacture of the lees, or wine oil on a large scale. For every 100 pounds of yeast (lees) Rauter takes one to one and a half pails of water, and one-half pound of sulphuric acid. After the distillation is over he adds to the residue for every pound of sulphuric acid employed, 3 pounds crystallized carbonate of soda, to

partly neutralize the acid. After 8 days the crystallized cream-tartar is separated by a sieve from the smeary mass; and from the latter a fine blackcolor is obtained after heating it to redness. There is obtained, besides variable quantities of alcohol and coloring matter, one pound of wine oil and from 150 to 200 pounds of raw cream tartar from 2500 pounds of lees. (P. 321).

Essence of cognac and wine. (Am. chemist. December 1872, P. 235). "The order of this essence is chiefly due to the presence of pelargonic ether. This is made by oxidation with nitric acid of the essence of rue (obtained by distillation from the *ruta graveolens*), by which means pelargonic acid is obtained. This is treated with potassa and sulphuric acid which purify it, and is then mixed with alcohol, and hydrochloric acid passed into it, which causes, the formation of pelargonic ether."

My object in giving the above recipes has been to furnish such information as to the method and the material used in the manufacture of artificial brandies, etc., as to enable one to decide to what extent these artificial products may be injurious to the health.

Of the material employed the most *objectionable* is unquestionably the oil of bitter almonds, since it happens occasionally that this oil contains considerable quantities of prussic acid, as the writer well knows from practical experience. Moreover it may happen, and it undoubtedly does happen, that nitro benzol — artificial oil of bitter almond, — is used in place of the genuine oil of bitter almonds, which is still more dangerous, since this substance in the presence of alcohol is very readily absorbed into the blood, "a few drops constituting a poisonous dose." (Prescott.) Hence the use of the impure oil of bitter almonds, and especially the use of artificial oil of bitter almonds or nitro-benzol, for the manufacture of liquors should be prohibited by law.

In the manufacture of *liquors* and *spirits* the product of the first distillation — the raw spirits — is too impure to be used as a beverage, hence it has to be rectified and purified to remove excess of fusel oil, etc. This is usually done by a redistillation at a low temperature or by passing it several times through peculiarly constructed filters, made with animal bone-black, manganese, pine wood charcoal, calcined magnesia, sand, etc., or it may be accomplished by both methods combined. Often before redistillation, the liquors are treated for from 10 to 12 hours with six pounds of oak bark, one-half pound of purified sal tartar, and one-fourth pound slacked lime per barrel, after which about three-fourths of the total amount of liquor employed is distilled over. As another method to purify raw spirits it is recommended to add to a barrel of 40 gallons, 4 ounces of pure sulphuric acid and mix well, allow to rest for three days, and then add 12 ounces of sal soda dissolved in a little water, mix thoroughly and test with litmus paper to see if neutral. To give a stronger taste to spirits, Dr. Feuchtwanger recommends the addition of "about two ounces of chloride of lime, rubbed up with a little sal soda, and add this in solution to the spirit."

"*Bead for Liquor.*" — "The best bead is the orange flower water, oil of neroli 1 drop, to each gallon."

"To every 40 drops of sulphuric acid add 60 drops of the best sweet oil, in a glass vessel; use immediately. This quantity is usually sufficient for 10 gallons of spirits."

h Take one ounce of purest oil of sweet almonds, one ounce of sulphuric acid, and put them into a stone mortar, add by degrees two

ounces of lump sugar, rubbing it well with the pestle till it becomes a paste, then add small quantities of spirits of wine until it becomes a liquid; this quantity is sufficient for 100 gallons; the first is strongly recommended as the best. "Secret Wealth," Watson Johnson, p. 104.

ANALYSIS OF BRANDY.

Twenty-five samples of brandy were received from the State Inspector, and were examined with the following results: In regard to color there was very little difference, the prevailing shade being amber, from pale to almost dark. The odor of brandy in most of them was fair but not very prominent. Free sulphuric acid, tested for as explained under wine, could not be detected in any one of these samples. The same must be said in regard to combined sulphuric acid, only a mere trace being found in one sample, which was undoubtedly due to the water used for the production of the liquors.

Results of the Examination of Samples of Brandy.

Number of the State Inspector.	Reaction.	Specific Gravity with temperature at which taken.	Alcohol.		Solid Residue at 212° F. Per cent.	Ash. Per Ct.
			By volume. Per cent.	By weight. Per cent.		
199.....	Acid.....	.9614 at 26.5° C.	30.80	25.39	0.163	0.008
200.....	Acid.....	.9600 at 21° C.	32.60	26.94	0.095	0.004
201.....	Neutral.....	.9579 at 21° C.	34.60	28.67	0.035	0.005
202.....	Slightly acid.....	.9579 at 24° C.	34.50	28.59	0.089	0.002
203.....	Slightly acid.....	.9435 at 26° C.	43.80	36.83	0.081	0.005
204.....	Acid.....	.9428 at 21° C.	44.70	37.64	0.430	0.012
205.....	Neutral.....	.9472 at 23° C.	41.60	34.84	0.067	0.006
206.....	Neutral.....	.9539 at 22° C.	34.60	28.67	0.142	0.003
207.....	Acid.....	.9506 at 21° C.	39.60	33.06	0.156	0.007
208.....	Almost neutral.....	.9444 at 26° C.	42.40	35.58	0.508	0.009
209.....	Acid.....	.9322 at 23° C.	49.90	42.44	0.402	0.007
210.....	Neutral.....	.9594 at 24° C.	33.20	27.47	0.136	0.003
211.....	Slightly acid.....	.9389 at 23° C.	46.70	39.48	0.745	0.005
212.....	Neutral.....	.9615 at 23° C.	31.40	25.91	0.113	0.004
213.....	Slightly acid.....	.9590 at 22° C.	33.60	27.80	0.058	0.006
214.....	Slightly acid.....	.9505 at 20° C.	40.20	33.68	0.103	0.006
215.....	Acid.....	.9391 at 21° C.	46.40	39.23	0.285	0.004
216.....	Very slightly acid.....	.9586 at 21° C.	33.10	27.40	0.109	0.003
217.....	Almost neutral.....	.9421 at 23° C.	44.00	37.00	1.499	0.009
218.....	Acid.....	.9579 at 23.5° C.	34.60	28.67	0.075	0.004
219.....	Acid.....	.9509 at 25° C.	38.40	32.24	0.103	0.007
220.....	Slightly acid.....	.9560 at 21° C.	40.20	33.63	0.091	0.009
221.....	Neutral.....	.9466 at 21° C.	42.80	35.92	0.025	0.004
222.....	Slightly acid.....	.9433 at 24° C.	43.20	36.38	0.148	0.006
223.....	Acid.....	.9297 at 25.5° C.	50.40	42.96	1.795	0.014

None of the samples contained chlorine; and in no case did I find lead, copper, zinc, antimony or arsenic.

The amount of alcohol in these twenty-five samples of brandy varies very considerably, hence the necessity of having a proper standard established by law.

Fehling's solution was applied directly for the detection of grape sugar; five samples showed considerable grape sugar, the rest very little; in none was it entirely absent.

Acetate of lead was added for the detection of certain coloring matters. These samples gave many precipitates, with colorless filtrates; Nineteen samples gave very slight precipitates and colored filtrates; three gave no precipitates.

Fehling's solution, applied to filtrate after adding acetate of lead gave a slight reduction in eight samples only.

Albumen gave brownish precipitates with the tannin, in all cases, the filtrate being colored in two cases only.

A portion of each sample was evaporated on a water-bath to about one-tenth, and the residue tested as follows:

a. The taste was sweet in eleven cases, astringent in three cases, not decided in the other samples.

b. The reaction was slightly acid in twelve cases, neutral in the others.

c. Ferric chloride showed considerable tannin in seven samples, and a very little in the others.

d. Gelatin gave a strong reaction for tannin in two samples, a decided reaction in eight, slight in four, none in eleven.

e. Fehling's solution showed grape sugar at once in fifteen samples, and gave a slight indication for grape sugar in all the others.

In testing for fusel oil with anilin oil and hydrochloric acid, sixteen samples gave a distinct reaction, six contained traces, and in three there was none.

The presence of oil of bitter almonds, nitro benzol, nitrous ether, etc., could not be proved in any of the samples under examination.

From the examinations made, it is quite clear that the manufacturers of artificial brandies, add those ingredients which are found in the natural product. The main distinguishing characteristics between the genuine and artificial products (or such as have been tampered with), are the flavor or aroma, the amount of alcohol, solid extract, ash, acidity, coloring matter and tannic acids.

WHISKEY.

Pure whiskey, like prue brandy, is a diluted alcohol with a peculiar flavor or aroma, due to the raw material employed in its manufacture, and developed during the fermentation, distillation and ageing of the liquor, as stated and explained under brandy.

The sources for the manufacture of whiskey are manifold, and whiskey has received certain names partly from the material from which it is made, as malt, wheat, rye, corn, potatoes, etc., and partly from the country or locality in which it is made as Scotch, Irish, Bourbon, Monongahela, etc., whiskey.

The raw materials usually employed in the manufacture of whiskey are, malt (made mostly of barley), barley, rye, wheat, oats, corn and potatoes; since these substances contain only very small quantities of sugar, it is evident, that the first operation of the brewer and distiller consists in the changing of the starch in these substances into sugar. This is accomplished by the action of a peculiar ferment called "diastase," during the process of mashing. The saccharifying power of the diastase (especially in the malt made of barley) is very great, and as it can change much more starch than is contained in the malt, raw grain is usually employed together with the malt in the proportion of one of the latter to from five to nine of the former. Moreover, it is not unusual to employ several kinds of grain, thus the Scotch distillers use two parts of malt, one part of oats, one part of rye, and seven parts of barley. The Irish distillers take two parts of malt, one part of oats, and seven parts of barley. English distillers often take twelve parts of malt, sixteen parts of oats, and one hundred and twelve parts of barley.

Dr. Johnson in his "Chemistry of Common Life" gives the following proportion: Malt 42 bushels at 40 pounds; oats 25 bushels at 47 pounds; rye 25 bushels at 53 pounds; barley 158 bushels at 53 pounds.

The diastase in the 42 bushels of malt, converts into sugar the starch of the whole 250 bushels weighing eight times as much as the malt itself. This quantity of grain yields on an average 583 gallons of proof whiskey, or 14 gallons from 6 bushels of the mixture. In an Irish grain distillery the components of the mixture for fermentation were:

	I.		II.		III.	
	Bush.	per cent.	Bush.	per cent.	Bush.	per cent.
Malt.....	280	14	240	12	80	14.25
Oats.....	320	16	280	14	120	21.50
Rye.....	600	30	320	16	80	14.25
Barley.....	800	40	920	46	280	50.0
Maize.....	...	..	240	— 12	...	.....

The time for mashing, as well as the temperature of the mash during that time, varies according to the object in view, and the raw material employed. To obtain the highest amount of alcohol, a low temperature must be maintained during mashing. When the saccharifying process is finished the resultant sugar solution is cooled to the proper temperature, and fermentation is induced by the addition of yeast. When fermentation ceases, distillation is commenced at once to prevent the acidification, souring of the alcoholic liquids. The resultant distillate, the raw whiskey, is purified to remove fusel oil, etc., in various ways, especially by rectification over charcoal and re-distillation as stated previously under brandy, the first portion of the distillate being usually sold as whiskey. When the fermentation of the saccharine fluid takes place at a low temperature or in the presence of tartaric acid, little or no fusel oil, amyl alcohol is formed. The peculiar flavor of Irish and Scotch whiskeys, is due in the first case to the employment of peat or birch wood in drying the malt, and in the second, to certain empyreumatic oils which distil over with the spirit.

In regard to the manufacture of distilled spirits, Rudolf Wagner says (Chemical Technology, 1872, p. 424): "Originally, that is to say when spirits (now some two and a half centuries ago), were first commenced to be made industrially on the large scale, it was only made for the purpose of being drunk, and the liquor prepared in the comparatively dilute state in which it is offered for sale for consumption. More recently (within the last forty or fifty years) the use of alcohol in various branches of industry is so great, that as a rule distillers *at once* prepare strong alcohol, which if required for consumption as a beverage, is suitably diluted and sweetened if desired." All distilled spirits are usually sold at what is called the proof standard. A spirit is "proof," according to the United States Government regulation, when it contains fifty per cent by volume of absolute alcohol. The English standard requires about fifty per cent of alcohol by weight (specific gravity of the former at sixty deg. Fahrenheit 0.9348, and of the latter at the same temperature 0.9190). The English standard was established according to an Act of Parliament, and "when (in England) spirit is said to be thirty per cent above proof, it means that one hundred parts of this spirit and thirty parts of water will yield one hundred and thirty parts

... per cent under
 ... contains one hun-
 ... should yield 56.78 of
 ... of alcohol; 100

... the same author: 100
 ... spirit at 50 deg.
 ... (a 2.2
 ... liter (a 2.2
 ... we give 45.80;
 ... of
 ... the average
 ... other spirit.
 ... for the
 ... gallons of
 ...

... spirit to
 ... it was
 ... the product of distillation
 ... or whiskey, containing
 ... it is made into
 ... spirit." About one-fifth
 ... and the other fifth contains
 ... proof and so left to ripen

... Grouven the following kind

	Vol. per cent,	Alcohol.	Wgt. per cent
...	62.0		54.2
...	50.3		42.5
...	49.9		42.3
...	49.4		41.5
...	45.0		37.9
...	60.0		52.2

... gives the alcohol strength of ten samples
 ... 44.3 to 51 per cent of alcohol by volume
 ... is 49 per cent; and of 257 samples
 ... thirty to fifty-nine per cent of alcohol by

... gives the following:
 "rye whiskey," wholesale price \$1.10 per gallon,

... and distilling by T. A. Tooley, page 218—London

... 187.
 ... of liquors to the Commonwealth of Massachusetts.

dark amber color, acid reaction, very pleasant odor and slightly astringent taste. Ethyl alcohol 32.5 p. c. by weight ; a small quantity of fusel oil ; 0.003 p. c. of acetic acid ; a very little tannic acid ; odor and flavor by presence of tonka bean and bitter almond oil (natural). Sugar was found, and the odor of maple sugar thought to be recognized. The solid residue was 0.379.

2. "Two year old rye whiskey," of light amber color and natural reaction. Alcohol 34.2 p. c. by weight ; fusel oil, a trace ; tannic acid, a trace ; caramel and sugar 0.002 p. c. ; sodium sulphate and acetates, traces ; solid residue 0.17 p. c.

3. "Three years' old rye whiskey," dark amber color, and reaction. Alcohol 40.6 p. c. by weight ; fusel oil, a trace ; acetic acid, 0.002 p. c. ; tannic acid, a trace ; sugar 0.005 p. c. ; solid residue, 0.16 p. c. The residue had a slightly bitterish as well as astringent taste.

4. "Old rye," \$6 per gallon at retail, dark amber color ; strong acid reaction ; fine ethereal aroma remaining after the alcohol has evaporated. Alcohol 51.2 p. c. by weight ; fusel oil, a trace ; acetic acid, 0.0012 p. c. ; tannic acid, 0.0003 p. c. ; sugar, a trace ; solid residue 0.73 p. c.

5. "Pure old bourbon," dark amber color, strong acid reaction ; alcohol 49.2 p. c. by weight ; acetic acid, 0.0024 p. c. ; tannic acid, a trace ; solid residue, very slight. This specimen was believed to have been flavored with burnt dried peaches.

ADULTERATION AND IMITATION OF WHISKEY.

The following receipts are taken from various sources :

"*Bourbon whiskey.* To 100 gallons of proof spirit, add four ounces of pear oil, two ounces of pelargonic ether, thirteen drams oil of winter green dissolved in ether, one gallon of wine vinegar, color with burnt sugar."

"*Monongahela whiskey.* Common whiskey, thirty-six gallons ; dried peaches, two quarts ; rye ground and burnt like coffee, one quart ; cinnamon, cloves and allspice, bruised, of each one ounce ; loaf sugar, five pounds ; sweet spirit of nitre, two ounces ; put these into four gallons of pure spirits, shake every day for one week, then draw off and add the whole to the thirty-six gallons of whiskey."

Another. "To 20 gallons of pure proof spirit add two pounds of dried peaches, two pounds of white sugar, one pint of burnt and ground rye, two ounces ground allspice, four ounces ground cinnamon, one ounce ground cloves. Infuse all the above ingredients in the spirits for five or ten days and then draw off."

Old Rye. "Take dried peaches, one-half peck, soak and roast them in a stove but do not burn them ; bruise and put them into a woollen (pointed) bag and leach good common whiskey over them twice slowly, sufficient for one barrel ; add afterward twelve drops of aqua ammonia to each barrel and with age you will have whiskey equal to old rye."

Another. "To 50 gallons of pure proof spirit add two ounces of pelargonic ether, one ounce of pear oil, ten drops oil of winter green, dissolved in 95 deg. alcohol, four ounces acetic ether, four drops oil of cloves dissolved in the acetic ether, color, if necessary, with burnt sugar."

Scotch whiskey. "To 46 gallons of 95 deg. alcohol add eight gallons best Scotch whiskey, eighteen gallons soft water, three pounds clarified

honey dissolved in one and one-half gallon of soft water, five drops of creosote dissolved in two ounces of strong acetic acid, one ounce pelargonic ether and one gallon of old ale."

Another. "To 35 gallons of pure spirit ten degrees over proof add fifteen gallons of best genuine Scotch whiskey, three drops creosote mixed with one ounce of acetic acid, and one ounce acetic ether."

Irish whiskey. "May be made by substituting Irish for Scotch whiskey in the preceeding recipe."

Irish whiskey. "To 30 gallons of pure spirit ten degrees over proof and five gallons of genuine Irish whiskey, one-half gallon old ale, four drops creosote in an ounce of acetic acid, and one ounce of pelargonic ether."

Scotch and Irish whiskey. "To 40 gallons of pure spirit add five gallons of Scotch or Irish whiskey, one-quarter ounce creosote dissolved in one quart of alcohol, one pound of loaf sugar, let stand for ten days."

Old Bourbon whiskey. "To 40 gallons of spirit add five gallons of good Bourbon whiskey, spirit of nitre two ounces, fusel oil from corn two ounces in one quart of alcohol; let stand four days."

"In order to convert a corn whiskey into a rye whiskey, add to four barrels of the corn whiskey; one pound of the essence of Monongahela, one ounce of sweet spirits of nitre, one gallon syrup of gum arabic."

Bourbon whiskey. "One pound of the essence of Bourbon, one ounce of sweet spirits of nitre, one gallon of syrup, four barrels of common rectified corn whiskey."

Irish whiskey. "One pound of the essence of Irish whiskey, one ounce of sweet spirits of nitre, one-half gallon of syrup of gum arabic, four barrels of good whiskey either rye or corn."

Scotch whiskey. "One pound of the essence of Scotch whiskey, one ounce of sweet spirits of nitre, one-half gallon of syrup of gum arabic, four barrels of common whiskey."

Imitation of Bourbon whiskey. "Mix together 40 gallons proof spirits, one-half gallon peach flavoring (steep for one month ten gallons dried peaches, ten gallons oak sawdust, and five pounds black tea, in 40 gallons proof spirits; strain and filter) one-half gallon hickory nut flavoring (crush one bushel hickory nuts and infuse for one month in twelve gallons of 95 per cent alcohol; strain and filter), one-half gallon highly flavored brandy, (given under brandy), one pint wine vinegar and one pint white glycerine. Add to these twelve drops oil of cognac dissolved in 95 per cent alcohol, and color with caromel."

Or: 36 gallons proof spirits, four gallons highly flavored proof rye whiskey, one gallon domestic brandy, (given under brandy) together with the same proportions of vinegar glycerine and oil of cognac as before."

Another. "To 36 gallons proof spirits add four gallons highly flavored proof Bourbon, one gallon New England rum, one-half gallon sweet Catawba wine (or one quart sherry wine), and one pound white glycerine, color to suit with caromel."

Another. "To 36 gallons proof spirit, add four gallons highly flavored proof Bourbon, one gallon malt whiskey, one pint wine vinegar, one pint syrup and twelve drops oil of cognac dissolved in 95 per cent alcohol; color with caromel."

Another. "To 40 gallons proof spirit, add one gallon hickory flavor one gallon domestic brandy, one pint wine vinegar, and one pound white

glycerine, with twelve drops oil of cognac dissolved in 95 per cent alcohol; and caromel sufficient to color."

Copper distilled Bourbon whiskey. "Dissolve one dram sulphate of copper in one-half pint of water, filter, and add it to forty gallons proof spirit, with one gallon peach flavor, one gallon brandy flavor, (mash 25 pounds raisins, 12 pounds prunes, 6 pounds figs, and one pineapple sliced; infuse for 15 days in 20 gallons proof spirits; stirring every day and then filter), one pint wine vinegar, one pound white glycerine and twelve drops oil cognac dissolved in 95 per cent of alcohol; color with caromel."

Rye whiskey. "To 40 gallons proof spirit add two gallons peach flavoring, one pint white vinegar and twelve drops oil of cognac in 95 deg. alcohol; color with caromel."

Sweet rye whiskey. "To 30 gallons proof spirit, 10 gallons proof rye whiskey and one gallon raisin flavor, colored with sufficient caromel."

Irish whiskey. "To 36 gallons French spirits, 20 above proof, add four gallons Scotch (Ramsey) whiskey, three pints best sherry wine, two pints syrup and ten drops sassafras flavor (granulate one-half pound sassafras bark and infuse it in one-half gallon 95 per cent alcohol for twenty days and then filter)."

Scotch whiskey. "To 36 gallons French spirits, twenty above proof, add four gallons scotch whiskey and one quart syrup."

The manufacturers of essences recommend the use of their essences usually with some coloring.

To improve the flavor of new whiskey. "Take a gallon of whiskey and four ounces of tea, four ounces of allspice, four ounces of carraway seed, two ounces cinnamon, shake occasionally for one week, use one pint per barrel."

To purify whiskey. "To forty gallons whiskey add one and one-half pounds unslacked lime, three-fourths pound alum, and one-half pint spirits of nitre, let stand for twenty-four hours and then draw off."

The most objectionable addition to whiskey recommended in these recipes are undoubtedly creosote and sulphuric acid and their use should be prohibited by law.

ANALYSIS OF WHISKEY.

In regard to the analysis of whiskey I can refer to the methods given under brandy.

The detection of the most common adulterants has been given under brandy to which I must refer, except in regard to creosote, which should be extracted either with ether or petroleum naphtha, and after evaporation of the solvents may be best recognized by its odor.

The result of my examination of twenty-five samples of whiskey, submitted, are given in the following table. It is evident that the addition of water and coloring matter is practiced more than any other adulteration. No free sulphuric acid could be found, and in only two samples could a reaction for sulphates be obtained.

Results of the Examination of Samples of Whiskey.

State Inspector's Number.	Reaction.	Specific Gravity by Pycknometer.	Alcohol.		Solid Residue. at 212° F. Per cent.	Ash. Per Ct.
			By volume. Per cent..	By weight. Per cent.		
124.....	Acid.....	.9682 at 20° C.	36.60	30.40	0.7580	0.0235
125.....	Neutral.....	.9516 at 27° C.	36.80	30.37	0.0550	0.0030
126.....	Slight acid.....	.9511 at 24° C.	36.30	31.91	0.0990	0.0050
127.....	Neutral.....	.9645 at 21° C.	29.90	24.60	0.1470	0.0050
128.....	Slight acid.....	.9525 at 22° C.	36.30	31.91	0.1190	0.0060
129.....	Slight acid.....	.9587 at 24° C.	34.00	28.13	0.0980	0.0060
130.....	Slight acid.....	.9500 at 23° C.	39.20	32.72	0.1660	0.0060
131.....	Slight acid.....	.9343 at 23° C.	48.50	41.16	0.2580	0.0060
132.....	Neutral.....	.9539 at 23° C.	36.60	30.40	0.1630	0.0020
133.....	Slight acid.....	.9562 at 22° C.	36.20	30.07	0.1365	0.0055
134.....	Slight acid.....	.9555 at 22° C.	35.60	29.41	0.1070	0.0230
135.....	Neutral.....	.9585 at 22° C.	35.30	29.19	0.0830	0.0290
136.....	Slight acid.....	.9428 at 24° C.	44.20	37.22	0.5485	0.0145
137.....	Neutral.....	.9249 at 20° C.	53.20	45.63	0.2460	0.0130
138.....	Neutral.....	.9369 at 20° C.	36.80	30.67	0.0998	0.0060
139.....	Neutral.....	.9592 at 21° C.	33.00	27.27	0.3720	0.0090
140.....	Slight acid.....	.9593 at 23° C.	34.20	28.34	0.0680	0.0040
141.....	Neutral.....	.9398 at 22° C.	44.00	36.99	0.1130	0.0080
142.....	Neutral.....	.9536 at 23° C.	37.00	30.74	0.0950	0.0030
143.....	Slight acid.....	.9550 at 24° C.	36.40	30.24	0.1009	0.0060
144.....	Neutral.....	Not taken.	28.90	23.75	0.0550	0.0050
145.....	Neutral.....	.9473 at 27° C.	39.70	33.14	0.0180	0.0060
146.....	Slight acid.....	.8696 at 21° C.	32.70	27.02	0.1800	0.0035
147.....	Acid.....	.9018 at 25° C.	60.80	52.56	0.2920	0.0070
148.....	Acid.....	.9114 at 23° C.	60.30	52.58	0.3190	0.0080

Slight traces of chlorine were detected in eighteen samples, probably due to common salt.

Fehling's solution showed grape sugar in all the samples.

Fusel oil was decidedly present in twenty samples, and a slight indication was had in all the others.

Acetate of lead gave a heavy colorless precipitate in two samples, a slight colored precipitate in seventeen samples, none in the others.

Albumen gave a heavy precipitate in seven samples, and a slight precipitate in all the others. The filtrate was colored in seven samples, almost colorless in the rest. A portion of each sample was evaporated to about one-tenth, and the residue was tested as follows:

a. The taste was sweet in six samples, sweet astringent in two samples, slightly bitter in one, slight and not characteristic in all the others.

b. The reaction was acid in six samples, slightly acid in four, neutral in the rest.

c. Ferric chloride gave a strong reaction for tannin in four samples, a decided reaction in twelve, a slight reaction in eight; none in the rest.

d. Gelatin gave a reaction for tannin in fifteen samples, showed traces in five, none in five others.

e. Fehling's solution indicated grape sugar strongly in five samples, clearly in eighteen more, showed traces in two, none in one.

RUM.

When the juice of the sugar cane, the molasses or the refuse obtained in the manufacture of sugar, are allowed to ferment, and the fermented liquor subsequently distilled, an alcoholic liquor is obtained, known under the name of "rum," which differs from all other alcoholic liquors in its peculiar aroma. Genuine "rum" then is a by-product of the cane sugar manufacture.

Pure rum, like the previously mentioned liquors, consists of alcohol, water, aromatic substances and more or less coloring matter due to the

oaken barrel in which it is kept. The aroma in this, as in all other liquors, is due to the volatile products of distillation; and it requires only a very small quantity of them, to impart to a liquor its peculiar flavor.

This peculiar flavor or aroma causes the specific difference in our alcoholic drinks.

The countries that especially produce rum are, the West and East Indies, America, both South and North, and France. Its manufacture does not differ much from that of the other liquors; but special attention must be paid to the temperature of the liquid during the process of fermentation, so that the acetous (or souring) fermentation does not set in, in consequence of the elevated temperature, to which usually the fermenting liquid rises during this process. The addition of yeast is usually unnecessary; in its place the planters in the West Indies employ a liquid called "dunder." This ferment consists of the lees and feculencies of former distillations, and is usually preserved from year to year, (since when stored it soon becomes covered with a thick film, and thus the air is excluded. To this is attributed the fine aroma of the genuine rum. "The richness of flavor peculiar to this spirit, and which has rendered it famous in all parts of the world, is undoubtedly derived from the raw juice and fragments of sugar cane, which are mashed and fermented with the other material in the tun." (Muspratt). Whether any influence on the aroma can be attributed to the addition of carbonate of potash, saltpetre, salt, or sea-water to the fermenting liquid, I am unable to state; but this much seems to be certain, that a liquor made from sugar has not the natural aroma of genuine rum. Muspratt says: "The Chinese, who prepare the famous arrack of Batavia, which, without contradiction, is the best of all rums, take much care in rectifying it, mixing with it during distillation a composition called *ragie*, in which is cinnamon and anise-seed, in such proportion as not to be perceived either by smell or taste, being only sufficient to do away with the otherwise nauseous odor of the liquor. The Madagascars throw in leaves of trefoil; the Asiatics mix with it the bark of a kind of thorny acacia, called *pattag*. Some persons put into the still, with the grape, the leaves of a tree named *attier* in the East Indies, and *pommier-canelle* at St. Domingo — *aenona squamosa* — which have a light, agreeable odor. Others have tried, with success, the mixture of peach leaves. All these substances impart to strong liquors a *pleasant bouquet and taste*, which proves that they are used to disguise the smell of the spirit and give it unctuousness." The use of pine-apples and guavas in the manufacture of rum in the West Indies, to give age to the product, is a well-known fact.

Rum, like all distilled spirits, is a colorless liquid as it comes from the still, and whatever color genuine rum (or any other distilled liquor) does possess, is obtained with age, and is due entirely to the cask in which it is kept, and rarely exceeds a light brown or amber tint. It may seem strange, but it is an undeniable fact, that the public mind puts much stress on the color of a beverage. The darker the color of a liquor or beer, the greater is the strength and age, in the opinion of most people, hence the custom of many manufacturers of rum to color their product at once, either with molasses or caramel (burnt sugar); and although both are perfectly harmless in themselves and are added only in very small quantities, their addition is a fraud on the community, if not an adulteration. To save expenses for freight in shipping rum, it is not uncommon for rum manufacturers to make their product very high in al-

coholic strength, which is afterward by the wholesale dealers reduced to the proper strength with water; that the fine aroma by such proceedings suffers considerably it is almost unnecessary to state.

ANALYSES OF RUM.

In Dr. J. König's book, "Die Menschlichen Nahrungs-und Genussmittel, etc.," the following analyses are recorded:

H. Grouven gives for rum, by volume, 49.7 per cent. alcohol; by weight, 42.2 per cent. alcohol.

J. König found in 100 cubic centimeters rum, specific gravity, 0.9378; alcohol by volume, p. c. 51.40; alcohol by weight, p. c. 43.7; extract, p. c. 1.260; ash, p. c. 0.059.

In the organ "Wieder die Nahrungsfälscher, Heft 7, Jahrgang iv, Juli, 1881, p. 105, Privatdocent Heinrich Berkhurts says: "to bring the problem to distinguish between genuine and spurious (*façon*) rum at least a step nearer its solution, I have examined a number of samples of unquestionable purity, and also artificial products, in regard to their specific gravity, alcohol, water and ash."

The following are his results:

	Jamaica Rum.	Specific gravity.	Percentage of Alcohol.		Extract matter		Ash.	
			By vol.	By weight.	or tot. sol. mat.			
1.	From docks of London,	0.885	75 p. c.	61.38 p. c.	0.668	p. c.	0.023	p. c.
2.	" Glasgow,	0.875	75 "	61.38 "	4.800	"	0.089	"
3.	" Bremen,	0.875	90 "	74.07 "	0.568	"	0.031	"
4.	Directly imported,	0.910	63 "	51.33 "	2.047	"	0.098	"
5.	From Bremen,	0.875	75 "	61.38 "	0.031	"	0.025	"
6.	"	0.870	63 "	51.33 "	....	"	....	"
7.	Out of a store in Braunschweig	0.875	75 "	61.38 "	....	"	....	"
8.	From the same source..	0.875	75 "	61.38 "	....	"	....	"
9.	Artificial product .....	....	48 "	38.94 "	0.469	"	0.033	"
10.	Similar one .....	....	72 "	58.86 "	0.926	"	0.021	"

Prof. James Babcock gives in his two reports, the alcoholic strength of 80 samples of rum as follows:

		Alcohol by vol. from		p. c. to	p. c.
49	Samples of rum,	33.		54.0	
8	" Medford rum,	"	"	47.5	" 50.0 "
4	" N. Eng.	"	"	49.	" 50.1 "
1	" Jamaica	"	"	..	" 50.0 "
7	" Cherry	"	"	Not given.	
11	" New	"	"	47.5	p. c. to 50.2 p. c.

For the methods of analysis I must refer to my previous remarks on the subject under wine, brandy and whiskey.

ADULTERATION OF RUM, ARTIFICIAL RUM, ETC.

That rum, like all other alcoholic beverages, is subject to adulteration, is undeniable. Prof. Prescott says on the subject in his "chemical examination of alcoholic liquors:" "Rum was originally distilled from fermented juice of sugar cane, and is now made to some extent from the residues and skimmings of sugar manufacture, but is mostly made of grain spirit with flavoring additions. Butyric ether (pineapple oil) is the characteristic flavor added to rum. Butyric acid is also often added

and with the dilute alcohol it forms butyric ether. The flavor is sometimes obtained by adding sliced pineapples to the spirit. The 'rum essence,' prepared to add to grain spirit and make rum, is made up of various substances, including many which are also used in 'brandy essence.'"

The addition of water or diluted alcohol (French spirit) to rum is practiced almost universally by common retail dealers all over the country. Artificial rum—façon rum—is prepared from diluted alcohol (reduced high wines), acetic ether, butyric ether, essence of violet flowers, decoction of raisins; St. John's bread, and oak bark, sugar-coloring, catechu tincture, etc. According to Dr F. Elsner a rum essence is prepared by mixing together 15 parts of butyric ether, 2 parts acetic ether, 2 parts vanilla tincture, 2 parts essence of violet and 90 parts of 90° Tralles alcohol. This is mixed with a decoction of raisins and St. John's bread, some genuine rum, and alcohol. Generally tincture of catechu, decoction of oak bark and sugar-coloring (caramel) are added in proper proportions. The preparation of another "rum essence," which when mixed with alcohol, gives at once a product resembling rum without any other addition, is as follows: 75 parts of alcohol—90° Tralles—50 parts wood vinegar, 30 parts sulphuric acid, 20 parts manganese and 10 parts of potato starch, are distilled, and the resultant distillate colored with caramel.

Imitation and Artificial Rums.

1. "Ordinary Rum." For 30 quarts—80° Tralles: Rectified spirit, 90° Tralles, twenty-six and two-thirds quarts; best "rum essence," three-eighths quarts; vanilla essence, one-tenth ounce; water, 3 quarts; St. John's bread, one-half pound; raisins, one-half pound. Mix first the spirit, rum, and vanilla essence, then boil the St. John's bread and raisins in the 3 quarts water for one-half hour, allow the decoction to clear; filter; allow to cool, and now add the latter to the former, and color with caramel.

2. "Average Rum." For 30 quarts—70° Tralles: Rectified spirit, 90° Tralles, twenty-one and one-half quarts; good Jamaica rum, two and one-half quarts; rum essence, one-fourth quart; vanilla essence, one-tenth ounce; water, 6 quarts; St. John's bread, one-half pound; raisins, one-half pound. Prepared as above.

3. "Good Rum." For 30 quarts—70° Tralles: Rectified alcohol, 90° Tralles, 19 quarts; good Jamaica rum, 5 quarts; rum essence, 6 ounces; vanilla essence, one-tenth ounce; water, 6 quarts; St. John's bread, one-half pound; raisins, one-half pound. Prepared as above.

4. "Jamaica rum, common." For 30 quarts—70° Tralles: Rectified spirit, 90° Tralles, 16 quarts; good Jamaica rum, 9 quarts; rum essence, 4 ounces; vanilla essence, one-tenth ounce; water, 5 quarts; St. John's bread, 5 ounces; raisins, 5 ounces. Prepared as above.

5. "Jamaica rum, average." For 30 quarts—70° Tralles: Rectified spirit, 90° Tralles, 12 quarts; good Jamaica rum, 15 quarts; rum essence, 3 ounces; vanilla essence, one-tenth ounce; water, 3 quarts; St. John's bread, 4 ounces; raisins, 4 ounces. Prepared as above.

6. "Jamaica rum, good." For 30 quarts—70° Tralles: Rectified spirit, 90° Tralles, 10 quarts; good Jamaica rum, 17 quarts; rum essence, two and one-half ounces; vanilla essence, one-tenth ounce;

water, 3 quarts; St. John's bread, 3 ounces; raisins, 3 ounces. Prepared as above.

7. "Jamaica rum, good." For 30 quarts—70° Tralles: Rectified spirit, 90° Tralles, 6 quarts; good Jamaica rum, 22 quarts; rum essence, one and one-half ounce; vanilla essence, one-tenth ounce; water, 2 quarts; St. John's bread, one and one-half ounce; raisins, one and one-half ounce. Prepared as above.

8. "Santa Cruz rum." To 35 gallons of New England rum add 5 gallons Santa Cruz rum and 1 drachm vanilla flavoring.

9. "Jamacia rum." 20 gallons spirits, 10 above proof; 20 gallons "New England rum," 10 above proof; one-half pound "Jamaica rum essence;" 1 gallon St. John's bread flavoring and 1 pound white glycerine. Color with caramel.

10. "Jamacia rum." 40 gallons spirit, 10 above proof; 1 pound Jamaica rum essence; 10 drops oil of cloves; 1 gallon St. John's bread flavoring; 1 pound white glycerine; and you may add 1 ounce gum kino, 1 drachm oil of caraway, each dissolved in 2 ounces 95° alcohol, and mix.

11. "Jamaica rum." To 45 gallons New England rum add 5 gallons of "Jamaica rum", 2 ounces butyric ether, one-half ounce oil of caraway, cut with alcohol of 95 per cent Tralles, and color with sugar coloring.

12. Or, add to 36 gallons of pure spirit 1 gallon Jamaica rum, 3 ounces butyric ether, 3 ounces acetic ether, one-half gallon sugar syrup; mix the ethers, etc., thoroughly, and color with burnt sugar.

13. "Santa Cruz rum." To 50 gallons pure proof spirits add 5 gallons Santa Cruz rum, 5 pounds refined sugar in one-half gallon of water, 3 ounces butyric acid, 2 ounces acetic ether, and color if required.

14. Or, to 45 gallons New England rum add 5 gallons of Santa Cruz rum and 5 drams vanilla essence.

15. "Rum." Five gallons of pure spirit; 5 pints of the rum you wish to imitate, and one-eighth ounce of oil of caraway seeds.

16. "Pineapple rum." To 50 gallons of rum, made by the fruit method, add 25 pineapples, sliced, and 8 pounds of white sugar; let it stand for 2 weeks before drawing it off.

17. "Jamaica rum" may be produced from the rectified spirit by employing 1 pound essence of rum; 1 ounce oil of pimento; 1 ounce tincture of orris root; one-half ounce Peruvian balsam. Dissolve the oils separately and then mix with them the essence, and throw them in a cask containing 160 gallons of pure spirit; or by the Jamaica rum flavorings, of which 1 gallon added to a barrel of pure spirits will produce an excellent rum.

18. "New England rum." This is generally prepared in the Eastern States by the distillation of molasses; but frequently this material is not so plentiful and resort is had to the common corn whiskey, which is once more rectified, and by adding 1 pound of strong essence of Jamaica rum and 1 pound of nitrous ether to 10 barrels of such purified corn spirits a good New England rum is obtained.

19. "Jamaica rum." Take to 40 gallons spirits, proof, one-half pound of the "Rum Essence;" one-half pint of our sugar coloring and 1 quart sugar syrup.

"St. Croix rum," "Batavia Arrac," "New England rum," the same as above, without the coloring.

In Fresenius "Zeitschrift" Jahrgang III, page 232, Birchöl-tinctur

and shining soot-tincture (glanzrusstincture), are mentioned as additions to artificial rum.

A practical liquor manufacturer recommends, first to prepare the so-called "rum-body" (rumkörper), as follows: Digest 10 pounds catechu with 8 quarts 96° (Tralles) alcohol several days with occasional stirring, till the supernatant liquid has become dark brown and the sediment light brown. Now boil 40 pounds fresh St. John's bread and 10 pounds raisins with 20 quarts water for 25 minutes; strain through a bag, and press the residue properly out. To the liquid obtained add 8 quarts alcohol. Now mix the clear liquid of the catechu tincture with the latter thoroughly, allow to settle, and use for 600 quarts of alcohol from 2 to 3 quarts of this mixture; flavor with No. 1 A. "Kingston rum-essence."

The substances used in the preparation of artificial rums require but a passing notice. The quantities in which they are used in these mixtures are but trifling as compared with the quantity of the product obtained. Moreover, none of them is, so far as I know, poisonous in the proper sense of the word.

The ethers employed in the preparation of artificial rums, whiskies and brandies, are mainly ethereal compounds of organic fatty acids with the oxides of ethyl and amyl, some of which are also used in the preparation of the well-known artificial fruit essences, so much employed now in the household, by confectioners, etc., for flavoring pies, ice creams, jellies, fruit syrups (*so-called*), soda water, etc. The recognition of their presence depends mainly on their odor, or that of the fatty acids contained in them. Evaporate a portion of the liquor (from 1 to 2 ounces), after the addition of a little caustic alkali, over a water bath at a low temperature, almost to dryness, allow it to cool, and then on the addition of a few cubic centimeters of concentrated sulphuric acid, their characteristic odor will appear. Or we may distill them with an alcoholic solution of caustic alkali. When all the alcohol has passed over, we add diluted sulphuric acid, distill again, and obtain thus in the distillate the volatile fatty acids of the ethers.

When we suspect the presence of nitrous ethers (sweet spirits of nitre), in a liquor, which, as we have seen, is often used in the compounding of artificial liquors, and not found in the genuine one, we must distill a portion of the liquor. The nitrous acid and the nitrite of ethyl will be contained in the first portion of the distillate; we test the latter by adding some iodide of potassium solution, starch paste, and finally, acetic acid; a blue color indicates its presence. Or we evaporate another portion of the liquor, after the addition of potassa to a slight alkaline reaction, over the water bath almost to dryness, and test the residue for nitrite and nitrate together by strong sulphuric acid and solution of ferrous sulphate (Prescott).

Since now the aroma of the genuine liquor depends, as much as that of the spurious ones on ethers, (produced in the former, as stated previously, by the action of the volatile fatty acids on the volatile alcohols during the time of keeping), it follows that except these ethers differ from those added to the artificial products, that the decision whether a liquor is genuine or artificial, cannot be properly and finally decided by an investigation of the ethers contained in the liquors,* especially

* Professor Prescott says in his book, page 59: "Artificial bouquets in wines and liquors may be so made and used as not to be distinguished from natural bouquet by chemical test."

since we do not even to-day know positively what different kind of ethers constitute the aroma in the various kinds analyses of rum of genuine brandies whiskies and rums.

ANALYSIS OF RUM.

The results of my examination of 25 samples of rum are contained in the following table :

Results of the Examination of Rums.

State Inspectors' Number.	Color.	Two-thirds rum, one-third concentrated sulphuric acid mixed. When cool odor of rum.	Reaction.	Specific gravity by Pyknometer at Celsius.	Alcohol.		Solid residue at 212° Fahr. per cent.	Ash per cent.
					Percentage by volume at 60° Fahr.	Percentage by weight.		
174.	Light brown.....	.....	Acid .....	.950 at 26°	37.00	30.74	0.0830	0.0010
175.	Amber	None.....	Very slightly acid...	.9490 " 24.5°	40.40	33.78	0.1250	0.0110
176.	Light brown.....	Good.....	Acid.....	.9411 " 23°	45.60	38.49	0.3860	0.0100
177.	Light amber.....	None.....	Slightly acid.....	.9392 " 24.5°	46.20	39.06	1.2050	0.0030
178.	Light amber.....	Good.....	Slightly acid.....	.9402 " 24.5°	45.10	37.99	0.3920	0.0090
179.	Amber	None.....	Acid .....	.9452 " 21°	43.90	36.91	0.7700	0.0140
180.	Light amber.....	None.....	Very slightly acid...	.9688 " 25°	26.40	21.66	0.2594	0.0105
181.	Amber	Good.....	Slightly acid.....	.9349 " 25°	44.90	37.90	0.4780	0.1020
182.	Light brown.....	Good.....	Slightly acid.....	.9414 " 23°	44.60	37.56	0.1354	0.0150
183.	Amber .....	.....	Very slightly acid...	.9348 " 25°	47.80	40.49	0.1700	0.0110
184.	Light brown.....	Good.....	Very slightly acid...	.9564 " 22.5°	34.70	24.74	0.2840	0.0040
185.	Light brown.....	Very slight.....	Slightly acid.....	.9412 " 26°	43.00	37.90	1.0100	0.0070
186.	Light amber.....	None.....	Very slightly acid...	.9653 " 22.5°	35.30	29.29	0.1110	0.0080
187.	Amber	Slight.....	Slightly acid.....	.9426 " 26.5°	43.80	36.82	0.2425	0.0750
188.	Light brown.....	None.....	Very slightly acid...	.9638 " 25°	30.00	24.69	0.2030	0.0065
189.	Light brown.....	Good.....	Acid .....	.9498 " 25°	38.70	32.25	0.2920	0.0050
190.	Light amber.....	None.....	Neutral.....	.9473 " 24°	41.40	34.67	0.0650	0.0030
191.	Light brown.....	Very slight.....	Slightly acid.....	.9645 " 25°	31.80	26.24	0.4500	0.0050
192.	Almost colorless.....	Good.....	Slightly acid.....	.9344 " 19°	49.75	42.26	0.0945	0.0026
193.	Dark amber.....	Good.....	Slightly acid.....	.9409 " 24°	45.60	38.49	1.5100	0.0110
194.	Light amber.....	Slight.....	Slightly acid.....	.9428 " 23°	45.15	38.10	0.2160	0.0100
195.	Light brown.....	Slight.....	Slightly acid.....	.9316 " 23°	50.30	42.87	0.1300	0.0200
196.	Brown	Slight.....	Slightly acid.....	.9454 " 19°	44.40	37.39	0.5660	0.0010
197.	Amber	Very slight.....	Slightly acid.....	.9445 " 24°	42.70	35.83	0.0750	0.0040
198.	Light brown.....	Very good.....	Acid .....	.9126 " 25°	57.80	50.04	0.6560	0.0090

No reaction for sulphuric acid or soluble sulphates was obtained except in one sample, and here only to the extent of a trace.

In eleven samples slight traces of chlorine were detected, probably due to common salt.

Fehling's solution gave a decided reaction in eighteen samples, very slight in four, none in three.

The reaction for fusel oil was distinct in all cases.

The filtrate, after adding acetate of lead, was colored, except in two samples.

Albumen gave a heavy precipitate in six samples ; some in all the rest. The filtrate was colored in eighteen samples ; colorless in the rest.

A portion of each sample was evaporated to one-tenth, and tested as follows:

a. The taste was sweet in sixteen samples, bitter in two, and not noticeable in the rest.

b. The reaction was acid in twenty-three cases and neutral in two.

c. Ferric chloride gave a strong reaction for tannin in three cases, a slight reaction in twenty, and none in two.

d. Gelatine gave a reaction for tannin in all cases but two, strong in five, decided in fifteen, and very slight in three.

e. Fehling's solution indicated grape sugar strongly in fourteen cases; clearly in the remaining eleven.

REMARKS ON ANALYSES OF SIMPLE LIQUORS.

Before speaking of the compound liquors a few remarks on the results obtained in my investigation of simple liquors may find a proper place here.

Unquestionably the most important ingredient in all distilled liquors is the alcohol. The results obtained in my investigation of the 100 samples of liquors received from the State Inspector and recorded on tables "A," "B," "C" and "D," appended to this report, go to show, that there is a very great variation in the quantity of this ingredient in the various samples, and if 50 per cent of alcohol by volume or proof (Tralles) is the proper standard, then it follows, with only a few exceptions, almost all the above samples have been watered to a greater or less extent. Thence it is absolutely necessary for your Honorable Board to agree on some alcohol standard for these four kinds of liquors, below and above which, no liquor should be sold to the consumer in the State of New York, and its addition to be considered an adulteration.

Next of importance to the alcoholic strength of these liquors, are undoubtedly their aroma (flavor), and their taste. To appreciate them properly requires the nose and tongue of an expert, but how much they are appreciated by the public is readily seen by the price paid for some of their brands; and in fact as stated before, it is the aroma and the taste which regulate entirely their market value. The aroma as I have said previously (in genuine liquors), is due to the compound ethers formed during the aging of the liquors by the action of the volatile acids on the volatile alcohols (the constituents of the various fusel oils). The quantity present of these aromatic ethers in liquors, is sometimes remarkably small, one part in 40,000 parts, or 0.0025 per cent. as stated by some authors. Even in the manufacture of artificial liquors, the manufacturers of the oil, essence, etc., employed for their preparation, recommend from one to sixteen ounces, or from 0.081 to 0.33 per cent of their respective preparations. Quantities as small as these are difficult to identify, except we have a sufficient amount of material at our disposal, since their identification depends mainly on the smell. Although the presence of fusel-oil was indicated by the aniline test in most of the samples submitted to examination, in only a very few could its presence be perceived by the smell according to the usual method of rubbing the liquor between the hands, etc.

THE COLORING MATTER.

Naturally all distilled liquors are originally colorless, but gradually they extract from the wood of the oaken cask some coloring matter, tannin, etc., and thereby become, according to age, more or less amber colored. This process of coloring is of course a very slow one, hence the habit of the rectifier to add various coloring matters which enables him to send his products sooner into the market. In regard to the various materials used for this purpose, Prof. Prescott says on page seventy-five of his valuable book—"The coloring substances which are used as additions to alcoholic liquors, are indefinitely numerous..... In consequence of the great number of these foreign coloring materials, and the chemically indifferent character of both the natural and foreign color substances, as well as because of their small proportional quan-

tity, their chemical determination is generally difficult, and sometimes impracticable."

E. Carles recommends the addition of some albumen to the sample of liquor, the mixture to be well shaken, when (as he says) the genuine liquor, after proper settling, will become colorless, while the artificial will not. (Caramel will not be effected by albumen.)

Basic acetate of lead precipitates most coloring matter, yielding after filtration a colorless liquid, while the caramel coloring is not apparently affected, as far as color is concerned. Ferric chloride gives in genuine liquors, a blue black precipitate in consequence of the tannates present, but does not affect caramel.

A solution of gelatine does not affect caramel, but precipitates the tannin in genuine liquors.

The results of these tests, I have given in the above mentioned tables, and they go to show that only a few in each of those three classes of liquors are not colored artificially by caramel.

ACIDITY OF LIQUORS.

Generally liquors are slightly acid, due to the volatile acids, especially acetic acid, which pass over during distillation, and which give rise to the ethers as stated previously. Sometimes acetic acid (vinegar) is added by the manufacturer or rectifier, to accomplish the same end (the production of acetic ether), during the aging of the liquor. In none of the samples examined *could free sulphuric acid* be detected, nor anything more than a trace of combined sulphuric acid and chlorine.

SOLID RESIDUE AND ASH.

Require no comments, their percentage in the genuine being as large as in those we must consider by my tests sophisticated or artificial. The addition of sugar, usually in the shape of simple syrup, is now so universally practiced to cover up the harsh or rough taste of new liquors, and to give age that it may be almost considered legitimate to day. I found in almost all of the samples, either grape or cane sugar, but have recorded only the former in my tables. (The liquor is heated almost to boiling for about fifteen minutes with some concentrated pure hydrochloric acid, after cooling neutralized with carbonate of soda, and tested in the usual way with Fehling's copper solution as given in Frsenius for sugar.)

No heavy metals like arsenic, copper, lead, zinc, etc., could be detected in any of them, they could of course be only due if present, to carelessness of the manufacturer or rectifier. The various samples of these liquors had after removal of the alcohol, no acid or decidedly bitter taste. Some were almost tasteless, others slightly sweet, and others sweet; a few astringent, or sweetish astringent, hence no grains of paradise, or other sharp spices had been used in their manufacture.

In how far, or if at all, in the production of these liquors, the additions of water, artificial ethers, acids, coloring matters, etc., may be allowed, and what kind, or which of these should be considered injurious to health or not, must of course be decided by your Hon. Board. I hope I have given due prominence in these reports on all those matters pertaining thereto.

GIN.

The most important of the compound liquors is the so-called "gin" or "Geneva" (Holland Schiedamschnapps) an alcoholic beverage, possessing the peculiar aroma of the juniper berry. The most renowned "Geneva" is manufactured in Holland, and exported from thence all over the world.

"Gin," or rather "Holland Gin" consists, like the other liquors previously spoken of, of alcohol and water, flavored with the oil of juniper (usually) or turpentine, or with both. It differs from the previously enumerated liquors in this, that in its manufacture a grain whiskey or spirit is redistilled with certain spices to give the peculiar aroma.

In Holland, the "Vaterland" of gin, it is usual to employ barley malt and rye meal in the preparation of the raw whiskey, and the latter is then after a proper rectification redistilled with some juniper-berries and occasionally with an addition of hops. In America it is more customary to take the oils in the proportion of about one fluid ounce of the oil of juniper to thirty-three gallons of spirit, or about one fluid ounce of turpentine to 10 gallons of spirit. Of other oils slight additions are made, of such as the oil of lemon, bitter almonds, caraway, cassia, cardamom and sweet fennel. Moreover, often some creosote, garlic and horseradish are added. These together with the required amount of water and some salt, are mixed together in the still, and then submitted to a redistillation. The objections to the use of creosote and oil of bitter almonds have been given previously. In England it is not unusual to use ordinary rectified grain spirit, together with a number of spices, etc., in the manufacture of the various brands of gin.

The following receipts have been taken from the "New Encyclopædia of Chemistry:"

	British Gin.	Cordial Gin.	Cordial Gin.	Fine Gin.	Lond'n Gin.	West Cou'ry Gin.	G'n'e'a.	Plain G'n'e'a.	G'n'e'a.
Juniper berries, German.	95 lbs.	70 lbs.	100 lbs.	96 lbs.	70 lbs.	14 lbs.	84 lbs.	84 lbs.	168 lbs.
Coriander seeds.....	95 lbs.	56 lbs.	70 lbs.	6 lbs.	70 lbs.	"	112 lbs.	84 lbs.	74 lbs.
Crushed almond cake....	46 lbs.	5 lbs.	"	"	3 1/4 lbs.	"	6 lbs.	"	12 lbs.
Angelica root.....	2 lbs.	2 1/4 lbs.	1 lb.	4 lbs.	1 1/4 lbs.	"	4 lbs.	2 lbs.	8 lbs.
Licorice powder.....	6 lbs.	6 lbs.	"	"	6 lbs.	"	"	2 lbs.	"
Orris root, broken.....	"	1 1/4 lbs.	2 lbs.	2 lbs.	"	"	"	2 lbs.	"
Cardamom.....	"	1 1/4 lbs.	1/2 lb.	"	"	"	1/2 lb.	"	1 lb.
Calmus root.....	"	"	2 lbs.	"	"	1 1/4 lbs.	6 lbs.	2 lbs.	2 lbs.
Grains of Paradise.....	"	"	"	4 lbs.	"	"	"	"	8 lbs.
Orange peel.....	"	"	"	2 lbs.	"	"	"	"	"
Casia buds.....	"	"	"	"	"	"	"	"	"
Sulphuric acid.....	"	"	"	"	"	8 lbs.	"	"	"
Spirit.....	650 gal.	700 gal.	950 gal.	960 gal.	700 gal.	700 gal.	950 gal.	950 gal.	950 gal.

During the process of distillation, of course only the volatile portions of these ingredients (the volatile oils) pass over and, impart their peculiar aroma to the liquor. Among the substances above enumerated as being employed in the manufacture of gin is one, the use of which is not only very objectionable, but dangerous to health, namely the almond cake — obtained from Bitter almonds — since prussic acid may be formed in the still and pass over into the distillate, the gin.

The following are all the analyses of gin, which I have been able to find recorded in the books at my disposal.

1. "Pure imported gin." Nearly colorless, acid reaction, sweet taste,

odor of juniper, alcohol 39.7 per cent by weight; acetic acid 0.0001 per cent; oil of juniper, cubeb and turpentine; solid residue 2.3 per cent containing sugar (0.9 per cent of the liquor) and potassium and sodium chlorides and nitrates (chlorine 0.0002 per cent) (See Amer. Chemist, August 1876, analysed by M. U. Green, Ph. D.).

2. Gin "Rip VanWinkle." "The sample was colorless, containing 51 per cent of alcohol at 60 deg. Fahrenheit (by volume) and gave in one fluid ounce 3.25 grains of solid residue. Bouquet delicate and lasting. Quality fine." (Prof. J. Babcock in his second annual report as Inspector and Assayer of liquors of Mass., Boston, 1877, page 38").

Prof. Babcock gives also the alcoholic strength of 155 samples of gin in his first and second State report as follows:

"Gin," 129 samples. Alcohol by volume from 33 to 50.6 per cent at 60° Fahrenheit; American gin, 8 samples. Alcohol by volume from 48 to 49.8 per cent at 60° Fahrenheit; "Holland gin," 12 samples. Alcohol by volume from 45 to 49.5 per cent at 60° Fahrenheit; "Rye gin," 5 samples. Alcohol by volume from 43 to 49 per cent at 60° Fahrenheit; "Swan gin," 1 sample. Alcohol by volume from 47.5 per cent at 60° Fahrenheit.

H. Grouven (Dr. J. König, vol. II, page 469) found 47.8 per cent Alcohol by volume, 40.3° per cent by weight.

The analytical method to be followed in the examination of gins does not materially differ from that of the other liquors previously considered, hence I must refer to what I have stated there.

To decide the question, whether a gin under examination is flavored with oil of juniper or oil of turpentine, may be done by extracting the oils, with benzol, petroleum, naphtha or ether, etc., mixing with water, etc., and finally evaporating the solvent at a very low temperature. The characteristic odor of the spice or oil employed will appear in the residue. (The distillate, the residue, or both, when determining the alcohol may be employed advantageously for this purpose.) Moreover, oil of juniper differs from oil of turpentine in this, that the former does not form with hydrochloric acid a solid, but deflagrates with iodine, while oil of turpentine forms in the cold a solid with hydrochloric acid having an odor resembling that of camphor, and with iodine it turns green and detonates.

Since "gin" is a compound liquor its method of preparation (like that of all compound liquors) as well as the various ingredients used in its manufacture, are chosen by each distiller at will, hence we can not speak of the adulteration of gin and other compound liquors as we do of that of wine, brandy or rum. Our main object in our analytical investigation must be therefore, to decide, if these liquors contain anything objectionable to health.

The following recipes have been taken from various sources, and they show together with those given previously, the great variety existing in the manufacture of this liquor.

"London cordial gin." "To 90 gallons of good gin add 1 drachm of oil of sweet almond, 2 drachms of oil of cassia, 2 drachms of oil of nutmeg, 2 drachms of oil of lemon, 3 drachms of oil of juniper, 3 drachms of oil of caraway, 3 drachms of oil of coriander, 3 fluid ounces of essence of orris root, 3 fluid ounces of essence of cardamom, 3 pints of orange flower water, 56 to 60 pounds of lump sugar, dissolved in 4 gallons of pure water. Dissolve the oils and essences in 2 quarts of al-

cohol of 95° Tralles, and add the mixture gradually till the proper flavor is produced; then mix in the dissolved sugar and add sufficient soft water with 4 ounces of alum dissolved in it, to make up 100 gallons. When all is perfectly mixed, add 2 ounces of sal tartar dissolved in 2 to 3 quarts of hot water; then stir up all and mix the liquor well once more and allow it to repose. In a week it will have become brilliant and may be racked off."

"Schiedam Schnapps," imitation. "Take gentian root, one-fourth pound; orange peel, one-fourth pound; puds, one-half pound, (but if this last cannot be obtained, poma aurantior, ripe oranges,) or agaric, one-fourth pound; best galangal, one-fourth pound; contaury, one-fourth pound; put pure spirit, 10 gallons, upon them, and let them stand two weeks; stir it every day, and at the end of that time put 3 gallons of this to one barrel of good whisky, then bottle and label.

"Aromatic Schiedam Schnapps." To 25 gallons of good common gin 5 over proof, add 5 pints strained honey, 2 gallons clear water, 5 pints of white sugar syrup, 5 pints of spirit of nutmeg mixed with nitric ether, 5 pints of orange flower water, 7 quarts of pure water, 1 ounce of acetic ether, 8 drops oil of wintergreen dissolved in the ether. Mix all the ingredients well, and if necessary fine with alum and salt of tartar."

To reduce "Holland gin." "To 25 gallons of pure Holland gin add 25 gallons of pure French spirit, one-half gallon white sugar syrup, and mix thoroughly."

"American gin" without distillation. Take 1 gallon of proof spirit, 1 ounce of juniper berries, 10 drops of oil of turpentine, 5 drops of oil of sweet fennel; rub the oils together with a sufficient quantity of loaf sugar, then add one-eighth pint of rectified spirits of wine, and now mix it well with the proof spirit. The next day add one-half pint of clear lime water and fine with a bit of rock alum the size of a pea; strain, and when clear add 2 or 3 quarts of sweetened water to reduce it to the proper strength. Will produce 12 to 14 pints of American gin.

"Holland gin." "To 100 gallons rectified spirit, add one and one-half ounce of English juniper oil, one-half ounce of angelica essence, one-half ounce of oil of coriander, one-half ounce of caraway oil (the oils to be dissolved in 90° Tralles alcohol first); mix thoroughly. To make it up for the trade add 45 pounds of loaf sugar and 4 ounces of rock alum; mix again thoroughly and finally add for finings 4 ounces of sal tartar."

"Or, to 40 gallons of proof spirits add of sweet spirits of nitre 3 ounces, loaf sugar 4 pounds, oil of juniper 1 ounce, oil of caraway one-eighth ounce—the last two dissolved in a quart of alcohol previously. After mixing let stand for 24 hours.

To prepare "Holland gin," take two and one-half ounces of the best juniper oil, 20 drops of oil of lemon, 15 drops of oil of coriander. Dissolve the oils in 2 quarts of high proof alcohol and let it stand over night, then put them in a forty-gallon barrel of pure spirits, and add 1 gallon of syrup of gum arabic."

"London cordial gin" is prepared likewise from two and one-half ounces oil of juniper berries, 20 drops of oil of calamurs, 10 drops of oil of angelica, 5 drops of oil of coriander; dissolve the oils, in 2 quarts of 95 per cent alcohol Tralles and add it to 40 gallons of pure spirits, and finally add 2 gallons of syrup of gum arabic."

"Should the liquor be milky it is necessary to filter it, which is done

by letting it run through a woollen filtering bag in which is contained a mixture of 4 ounces of burnt alum, 6 ounces of white pipe clay, 4 ounces of carbonate of magnesia, one-half ounce dry pearl ashes." "This compound is suitable for all liquors which have become milky by the addition of any essential oil to weak spirits. It is always necessary to pour the filtered alcohol in small quantities into the barrel containing the pure spirits, and to shake the barrel every time a fresh portion of the same is added, then the gin will remain clear, otherwise it will become milky again and occasion much trouble and difficulty to filter forty gallons of gin through the bag." In order, however, to avoid the trouble of filtering the gin, flavoring may be employed for the purpose, and one gallon of the flavorings thrown into a barrel containing from forty to forty-five gallons of pure spirits will produce a clear gin, and answer all the requirements of Holland or English gin."

"Genèvre, for 30 quarts of 50° Tralles." "Juniper berries, 5 pounds; alcohol, 80° Tralles, 20 quarts; water, 10 quarts; distil off 20 quarts, add the necessary alcohol and water and one pound of sugar."

"Genèvre, for 30 quarts of 50° Tralles." "Oil of juniper, one and one-half ounce; sugar, 1 pound; alcohol, 90° Tralles, sixteen and two-thirds quarts, and the necessary water."

"Genèvre-Holland, for 30 quarts of 50° Tralles." Genèvre oil, one and one-fourth ounce; sugar, 1 pound; wine spirit essence, one-fourth ounce; St. John's bread, one-half pound; rectified spirit, sixteen and two-thirds quarts. The sugar and St. John's bread are boiled with water for one hour, then filtered, and finally mixed together with the rest, and the necessary water added."

"An other for thirty quarts of 50° Tralles." "Holland genèvre essence three ounces, sugar one pound; St. John's bread one-half pound, rectified spirits of 90° Tralles sixteen and two-thirds quarts; add the necessary water to bring it to 50° Tralles."

"Imitation of Schiedam Gin." "Dissolve three and one-half drachms oil of juniper in sufficient ninety-five per cent alcohol to make a clear liquid; add it to forty gallons French spirit, ten above proof, with eight ounces of orange flavoring (given previously) one quart syrup, and thirty drops oil of sweet fennel."

Imitation "Old Tom London Gin." "Dissolve in one quart ninety-five per cent (Tralles) alcohol, one drachm oil of coriander, one drachm oil of cedar, one-half drachm oil of sweet fennel, one half drachm oil of bitter almonds, one-half drachm oil of angelica; add it to forty gallon French spirit ten above proof, with one pint of orange flower water, one quart syrup, and one drachm oil of juniper; dissolved in sufficient 95° alcohol (Tralles) to be clear."

The manufacturer of liquors, when he uses oil, etc., in their preparation, is often compelled to clarify or fine his products to make them clear, and thus acceptable to the trade, and for this purpose he usually employs alum and carbonate of soda or potash (sal tartar, pearl ash). I may therefore be permitted to quote here all of these recipes, even if I should repeat one or the other previously mentioned.

"To make spirit finings. Pulverize one pound ordinary crystals of alum, divide into twelve equal portions, and put up in blue papers marked number 'one'; next take six ounces carbonate (the ordinary sesquicarbonate) of soda, divide it into twelve parts and put them up into white papers marked number two. In place of the six ounces carbon-

ate of soda, four ounces dry salt of tartar may be substituted, but the white paper containing this latter substances must be kept in a dry, well corked bottle or jar."

"To clarify gin or cordials. To clarify from thirty to thirty-six gallons gin, dissolve the contents of one of the blue papers (as prepared in the previous recipe), in about one pint of warm water, and stir it into the liquor thoroughly. Then dissolve the contents of one of the white papers in about one-half pint hot water and stir well into the liquor, bung the cask close, and let the whole remain till the next day."

"To blanch gin or other white liquors. By using double the quantity of finings, that is, two of each of the powders as laid down in foregoing recipe, the liquor will be blanched as well as clarified. It is well to recollect, however, that the more finings are employed, the greater the risk of injuring the liquor, which may have a tendency to become flat when on draught."

"To remove the blackness from gin. Some gin has a peculiar blackness; to remove which, take one ounce pulverized chalk, and two or three ounces isinglass, dissolved; put this into the gin and it will become transparent. The above is enough for fifty gallons. The blackness which gin sometimes contracts by coming in contact with iron may also be carried down by putting a solution of two ounces isinglass and one quart skimmed milk into the spirits. When the color is very black, which will happen by merely an iron nail having fallen into the liquor, there is no remedy but to have the liquor distilled over again."

"To clarify stained gin. When gin has once become much stained, the only remedy is to redistill it; when it is only slightly stained, the addition of a few pounds acetic acid to a pipe or butt, one or two spoonfuls to a gallon, or a few drops to a decanterfull, will usually decolor it. Dissolve two ounces of burnt alum in a little warm water, and add the solution to thirty quarts liquor, and shake thoroughly or draw several times a few quarts off and pour it back into the barrel. One-half ounce isinglass cut into small pieces, alcohol one and one-half ounces, water one pint. Soak the isinglass in the water and alcohol for several hours, then boil the mixture slowly till the isinglass is dissolved, and filter hot. Three ounces of this mixture is sufficient for thirty quarts liquor." To thirty quarts liquor or whiskey take the white of four eggs beaten to foam, and mix thoroughly. To thirty quarts liquor pour one pint sweet milk, mix, and in a few days it will be clear. Powder three-fourths ounces soda, one-fourth ounce burnt alum, and one-half ounce burnt lime, mix with water, let settle, and pour the clear liquid into thirty quarts liquor. Into one quart of wine vinegar and one quart of water stir the white of eight eggs; heat the mixture to 100° Fahr.; let it cool and fill the same in bottles for use if required. A very small quantity is sufficient, say one quart of the mixture to one barrel of any liquor which may have become turbid, to clarify it. Rub up half an ounce of burnt alum, half an ounce of prepared chalk and the white of two eggs in a pint of water."

"To clear and find liquors. If after mixing the liquid it does not become clear, add from one to three ounces of pulverized burnt lime, and return the liquor to clean barrels. White wines fine with isinglass one and one-half ounces dissolved in one and one-half pints of water per hogshead. Red wines fine with the white of eggs, in the proportion of twelve to eighteen to each pipe; they must be well beaten to a

froth, with about one pint of water, and afterward mixed with a little wine before adding them to the wine; mix well."

ANALYSIS OF GIN.

The results of my investigations of the twenty-five samples of gin received are contained in the following table. The same remarks I have made in regard to the results obtained by my investigation of the previous seventy-five samples of liquors are also applicable here, hence there is no necessity to repeat them.

Results of the Examination of Gin.

State Inspector's Number.	Color.	Specific Gravity by Pycnometer.	ALCOHOL.		Solid residue at 212° Fahr.	Ash per cent.	Fusel Oil.
			By vol. per cent.	By w't. per cent.			
149.....	Light yellow.....	0.9523 at 21° C.	37.28	30.90	0.018	0.002	None.
150.....	Colorless.....	0.9624 at 22° C.	32.44	26.78	0.018	0.005	None.
151.....	Colorless.....	0.9529 at 27° C.	37.70	31.34	0.048	0.005	None.
152.....	Light yellow.....	0.9630 at 22° C.	32.14	26.53	0.772	0.001	Distinct.
153.....	Light yellow.....	0.9592 at 25° 5 c.	31.09	25.64	0.027	0.008	None.
154.....	Colorless.....	0.9522 at 18° C.	45.84	38.61	0.081	0.013	Trace.
155.....	Light yellow.....	0.9634 at 24° C.	28.77	23.64	0.038	0.004	Trace.
156.....	Light yellow.....	0.9609 at 21° C.	30.71	25.32	0.020	0.009	None.
157.....	Light yellow.....	0.9456 at 25° C.	40.05	33.44	0.140	0.019	None.
158.....	Colorless.....	0.9594 at 23° 5 c.	22.51	18.64	0.034	0.003	None.
159.....	Colorless.....	0.9398 at 20° C.	39.70	33.15	0.069	0.002	None.
160.....	Colorless.....	0.9560 at 26° C.	32.93	27.22	0.284	0.007	None.
161.....	Light yellow.....	0.9408 at 25° C.	44.79	37.67	0.126	0.008	Trace.
162.....	Light yellow.....	0.9507 at 27° C.	35.78	29.70	0.054	0.002	Trace.
163.....	Colorless.....	0.9563 at 26° 5 c.	31.17	25.71	0.055	0.003	Trace.
164.....	Light Yellow.....	0.9584 at 21° 5 c.	33.20	27.44	0.044	0.013	Trace.
165.....	Colorless.....	0.9408 at 22° C.	46.43	39.19	0.325	0.001	Distinct.
166.....	Light yellow.....	0.9634 at 24° C.	28.78	23.64	0.034	0.006	None.
167.....	Light yellow.....	0.9477 at 22° C.	39.42	33.13	0.044	0.012	Present.
168.....	Light yellow.....	0.9564 at 24° C.	33.73	27.84	0.054	0.003	None.
169.....	Light yellow.....	0.9448 at 22° C.	38.71	32.28	0.037	0.007	None.
170.....	Colorless.....	0.9446 at 23° C.	40.76	34.04	0.037	0.004	None.
171.....	Colorless.....	0.9556 at 21° C.	35.03	29.04	0.123	0.012	None.
172.....	Colorless.....	0.9538 at 23° 5 c.	33.45	27.64	0.030	0.001	Trace.
173.....	Colorless.....	0.9302 at 25° 5 c.	51.90	44.33	0.057	0.007	Distinct

Reaction ; four samples gave a decidedly and four a slightly acid reaction ; the rest were neutral.

Chlorine was indicated in very small quantities in six samples, due probably to the presence of a little common salt.

Free sulphuric acid, as well as *soluble sulphates*, entirely absent from all the samples.

Sugar was detected in Nos. 152, 157, 160, 163, 165, 168, and 173.

The heavy metals were not detected in any of the samples.

LIQUORS.

In regard to other compound liquors, double spirits, liquors, cordial, absynths, stomach bitters and essences, crèmes, ratafias, punch extracts and essences, aromatic alcohols and waters used in their preparation, I can only speak here in general.

Many of them are prepared either by distillation of aromatic flowers, leaves, herbs, barks, seeds, fruits, peels, roots, raisins and essential oils ; together with wines, ethers, aromatic essence and waters, etc., with rectified spirit and water, or by mixing the essential oils of these aromatics, and the other previously mentioned substances with the necessary rectified spirit, water, sugar syrup, etc., and coloring matter. The mixing

is done either cold or warm, viz., the sugar solution is added to the spirit and etherial oils, etc., either warm or cold. The same is done often when mixing the aromatic distillate with the necessary sugar solution. A warm mixing (which should always be done in a barrel, to prevent too much loss of alcohol) is preferable, since the liquor clears sooner and and is of better consistency. When the liquors are prepared by the cold method, the oils and essences must first be dissolved in some strong spirit, 90° Tralles, before they can be added to the spirit. The coloring in both cases is done after the perfect mixing of all other ingredients.

The names and numbers of these aromatic liquors are too many to give them in this connection, but I may be permitted to give a few more facts in regard to them. A single recipe-book before me, contains 521 recipes. In their preparation over 100 different ingredients are used, among which we find :

Anise-seed, angelica root, ambra essence, elecampane, aloes oil of aneis, ananas ether, ananas essence, oil of angelica, apricots, sulphuric ether oil of elecampane, oil of wormwood, alum, seeds of angelica, bitter almonds, oil of bergamot, essence of bergamot, marsh clover, oil of bitter almonds, oil of valerian, huckleberry juice, boone-kamp essence, coriander, cardamom, cassia wood, oil of lemons, essence of lemons, sweet flag, blessed thistle, columba root, oil of cardamon, coca beans, oil of coriander, oil of sweet-flag, oil of cubebs, quinine bitter essence, cassia vera, gentian root, poly poddy, straw berries, fennel seed, figs, oil fennel, catarrh root, genevre oil, essence of raspberry, oil of hops, raspberries, raspberry ether, raspberry juice, Hoffman's anadine, Spanish hop leaves, ginger, oil of ginger, Jamaica rum, St. John's bread, caraway seeds, cherry pits, chamomile German, chamomile Roman, oil of chamomile, oil of caraway seeds, cherry juice, coffee, peppermint oil of peppermint, laurel berries, oil of bay, lavender flowers, oil of lavender, Canadian agaric (*Boletus laricis*), mace, nutmeg, muscat wine, lemon balm, sweet marjoram, oil of mace, oil of balm, oil of marjoram, cloves, oil of cloves, nuts, orange flower water, orange flowers, oil of orange flowers, oil of origanum bitter oranges, bitter orange peels, wild carrot, grains of paradise, root of pimpnel, Peruvian balsam, oil of parsley, oil of wild carrot, peach ether, quassia-wood, leaves of rosemary, rose leaves, oil of rose, oil of rosemary, rhubarb, starnis, sage, liquorice-wood, celery seeds, sassafras, saffron, oil of staranis, oil of sage, oil of celery, oil of sassafras, oil of sandal, thyme, oil of thyme, tea, centaury, tormentil (root), large valerian, orris root, vanille and tincture, essence of violet flowers, juniper-berries, wormwood flowers, oil of juniper-berries, white wine, roman wormwood, hyssop, Ceylon cinnamon, cassia barks, cassia buds, zedoray root, oil of cinnamon, oil of cinnamon leaves, oil of cinnamon flowers, sugar coloring, etc.

Since almost invariably these liquors are colored, often blue, green, red, etc., it is but proper that I should give their preparation from the same source.

Blue colors — Indigo color.

One and one-half ounce finely powdered indigo mix in a three quart stone jar with six ounces of sulphuric acid of 66° Beaume, let stand at a modern temperature several days then add under constant stirring one pint of pure water.

Violet-blue color. One and one-half ounces cochineal ; digest with 10

quarts alcohol, 85° Tralles, from four to five days, then add 1-4 ounce burnt alumn, filter and finally add 1-2 ounce ammonia.

Yellow colors — Saffron color. Saffron, 1 ounce ; rectified spirits, 86° Tralles, 1 quart ; macerate eight days and then pour off the clear liquor and filter.

Another saffron color. Saffron, 1 ounce ; rectified spirit, 85° Tralles, 1 pint ; water, 1 pint ; macerate fourteen days, pour off the clear liquor and filter.

Curcuma color. Digest during eight days 1 pound coarsely powdered curcuma root with 1 quart alcohol of 85° Tralles, and then pour off the clear liquor.

Yellow color. One-half pound ginger, macerate for eight days with 1 quart of alcohol of 85° Tralles, and then pour off the clear liquid.

Green colors. Mixing the ginger, curcuma or saffron colors with the indigo color gives fine green colors ; or, dissolve in warm water, curcuma, 2 ounces, wash-blue (Prussian blue?), 4 ounces, burnt alum 1 ounce, let the mixture stand four or five days, then pour off the clear liquid ; or, take 3 pounds fresh grass and macerate it fourteen days with 1 quart rectified alcohol of 90° Tralles, then press and filter — a better color may be obtained when, in place of grass, dried nettles are employed, without injuring the taste.

Red colors—Brazil-wood color. Brazil-wood, one-quarter pound ; burnt alum, 1 ounce ; cream tartar, 1 ounce and boiled with 1 quart water one-half hour, after cooling the mass is pressed out, the liquid filtered and some alcohol added.

Saunders-wood color. Digest for eight days 3 ounces red saunders-wood with 1 quart rectified alcohol of 85° Tralles, press and filter ; or 1 pound huckleberries, digest for eight days with 1 quart alcohol of 85° Tralles, press and filter ; gives a more violet than red color.

Cochineal color. Cochineal, 1 ounce ; burnt alum, 3-8 ounce, boil with one pint of water ; after cooling pour off the clear liquid, filter and add some alcohol.

Another cochineal color. Cochineal, 1 ounce ; sal tartari, 1 ounce ; burnt alumn, 1 ounce ; rectified spirit 85° Tralles, 1 quart, digest eight days and filter.

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III. MALT LIQUORS.

Under the name "Beers," in the widest acception of the word, are included beverages which are produced by vinous fermentation, and which usually are still in a state of slow after-fermentation. They differ from distilled liquors, especially in their larger amount of solid matter remaining after the removal of water and alcohol. This residue consists of sugar, dextrine, albuminoids, phosphoric acid, potash, etc.

If we accept this definition of "beers," it follows that they may be made from any saccharine or starch-containing material; thus opening the door for the unscrupulous manufacturer to use all kinds of adulterations, substitutes, etc. Hence it is absolutely necessary to define

"beers" as the Bavarian government has done, namely: as wine, like liquids, yet in a state of after-fermentation *prepared only of barley malt, hops, yeast, and water*. To this might be added the lowest amount of malt and hops to be employed by the brewers in the manufacture of a barrel of beer of 32 gallons, and also the age the beer should have attained before it reaches the consumer.

All similar beverages produced by the use or substitution of various other materials for malt and hops, must be sold under names indicating the substitutes employed, as "rice beer," "wheat beer," "corn beer," "glucose beer," etc. Thus all fraud would be prevented, a more uniform product obtained and a wholesome beverage be insured.

The main constituents of normal beer may conveniently be divided into three classes:

1. The volatile constituents, carbonic acid, water, alcohol, acetic acid, etc.
2. The extract forming constituents, sugar, dextrin, albuminoids, glycerine, lactic and succinic acids, organic extractive matters from hops, hop resin, hop bitters, lupulin, etc.
3. The mineral constituents, the ash, phosphoric acid, potash, soda, silica, etc.

The present almost innumerable varieties of beer are distinguished by the trade and the consumer from each other:

First, by the material used in their preparation — barley malt, wheat, rice, rye, oats, corn, potatoes, grape sugar glucose, beet sugar molasses, cane sugar molasses, etc.

Second, by their alcohol and extract strength—ale, porter, stout, bock, doppel, lager, present use beers, "Braunschweiger Mumme," etc.

Third, by their color, due to the degree of heat to which the malt is subjected during the drying, or to the addition of beer color, caramel, molasses, etc.—dark, brown, amber, light yellow beers.

Fourth, by the method of fermentation employed, either superficial "Obergährung" (ale, porter, stout, etc.), or sedimentary, "Untergährung" (lager beers, etc.)

Fifth, by the degree of acidity (lactic and acetic acids) or sweetness—Belgian "lambick, etc. And *finally* by the name of the country locality, or individual manufacturer. "Scotch ale," "Bohemian and Bavarian" lager biers, Wiener, Munchner, Erlanger lager biers, London and Philadelphia porters, Zacherl's Doppelbier, Salvatorbier, etc. A few historical remarks on our now almost national beverage may find their proper place here.

The art of brewing is undoubtedly one of the oldest on record, and probably is due to the inventive genius of the ancient Egyptians; since we are told by Diodorus of Sicily (30 B. C.), that the Egyptian King Osiris, as early as 1960 B. C., introduced a beverage into his kingdom made from malt and fermented grain; and Herodotus (450 B. C.), speaks of beer as a common drink among the Egyptians, who called it wine of Pelusium, at which city a very highly esteemed beer was produced. Xenophon (400 B. C.), refers also to a fermented beverage from barley. Archilocus (720 B. C.), Aeschylus and Sophocles (400 B. C.), and Theophrastus (370 B. C.), speak of a barley wine *vinum hordeaceum*; while Aristotle, Strabo, and others, refer to it under the name of *sythos*.

From the Egyptians the Greeks acquired the art of beer-making, and

from these again other nations in Europe. Plinius (80 A. D.), speaks of a beer produced in Spain, and called *celia* or *ceria*, while the ancient Gauls called it *cerevisia*. According to Tacitus (*Cornelii Taciti de moribus germaniae*. "Potus humor exhordeo aut frumento in quandam similitudinem vini corruptus.") The ancient Germans prepared a beverage from barley and wheat.

According to old German guild books, Gambrinus, King of Flanders and Brabant (1200 B. C.), was the inventor of beer, and the German brewers of to-day hold him in high esteem. Eumens (A. D. 296) says: "Britain produces such abundance of corn that it was sufficient to supply not only bread, but a liquor comparable with wine." The use of beer had become so general in Britain in the seventh century, that Ina King of Wessex, levied a tax to be paid on ale. In Nurnberg, in 1299, the price for brown beer was regulated by a tax, and in Breslau in 1301, the malting and brewing were independent trades.

Grässe doubts the use of hops at the time of Charlemagne, though in a deed or gift executed by his father Pepin, in 768, there is mention made of a hop-yard, and in a document from the year 822, the miller of the chapter Corvey was dispensed by the abbot, from the labors in the hop-yard.

The oldest work on brewing is in Latin written in the year 1585. "*De cerevisia ejusque conficiendi ratione, natura, viribus et facultatibus*." Written by Thaddeus Hagecius ab Hayk, who, on 50 pages describes the methods of beer brewing, according to the common practice then in use. "In 1761 was published the first edition of Michael Combrune's "*Theory and Practice of Brewing*," the first work that attempted to treat of this industry on scientific principles."

THE BREWING OF BEER

Comprises the following four main operations:

1. The malting of the barley, and the grinding or crushing of the malt.
2. The mashing of the malt, the boiling, hopping, and cooling of the wort — properly called brewing.
3. The fermentation of the beer-wort.
4. The fining, ripening and preservation of the beer.

1. *The Malting of the Barley.*

This comprises:

First. The steeping of the barley in water till it has taken up about 50 per cent of this liquid, when it is washed several times to remove any slimy matter that may have been formed.

Second. The germination of the steeped barley, on proper floors in specially constructed buildings, in heaps, etc., when sufficiently advanced, is checked by the maltster by making the heaps thinner, and turning the grain several times during the day, till sufficiently dry for the kiln or drying cylinder. The time required for germination on the floors, is from eight to eighteen days, according to the temperature maintained in the heap and room.

Third. The drying or roasting. This is done in various ways, in kilns, cylinders, with hot air, steam, etc. At first the temperature must be very low, and gradually increased in the proportion as the malt looses

moisture. The higher the temperature rises during the drying and roasting of the grain, the darker the resultant malt and beer. Malt is therefore distinguished as pale, amber, brown and black malt.

The main change going on in the barley during the process of malting, is the formation of a ferment from the gluten (protein) which in the mashing process acts on the starch, changing the latter mainly into malt-sugar, maltose, and dextrines. This ferment is called "diastase." Moreover another ferment, "peptase," is formed, whereby during the same process, peptones and parapeptones are produced from the gluten or protein. The roasted malt crushed between rollers or otherwise, is now ready for the mash tub.

The importance of producing a first-class malt cannot be over-estimated, since on its quality the quality of the beer mainly depends. Hence the selection of the grain, the time of steeping, the proper moment for stopping germination, the temperature to be maintained in drying, and roasting, etc., are all of the utmost importance in the production of a good malt, but the most important item in its production is the water used in steeping and washing, since bad water must undoubtedly produce bad malt, and also bad beer. Hence brewers should never overlook this matter, but should secure for their breweries the purest water obtainable. It should be free from *organic matter*, especially such as may be due to infiltration from sewers, vaults, cesspools, etc.

2. *The Mashing of the Malt, etc.*

There are several methods employed, but the two most important ones are the infusion and decoction methods, which it would be out of place here to describe. Suffice it therefore to state that they mainly consist in a digestion and extraction of the malt with hot water, during which process the starch is mainly changed into maltose sugar and dextrine, etc., and thus becomes soluble in the hot water. When the saccharification of the starch has been accomplished, the resultant wort is drawn off, and put into suitable vessels for concentration. Hops are then added, the tannin of which removes a portion of the albuminous substance during boiling. The boiling wort extracts from the hops not only the tannin, which thus assists very materially in the clearing of the wort, but also the bitter principle, the aroma, the resin, etc.; and on these mainly depend the peculiar, pleasant, bitter taste and the fine flavor of a good beer. Preserving qualities are also imparted to the wort from the hops. The degree of concentration of the wort depends—like the quantity of malt and hops taken—on the kind of beer the brewer wishes to make. From 8 to 25 per cent of extract in the wort are, under ordinary circumstances, about the limits.

The cooling of the wort is done in various ways; but it is of the utmost importance to cool as rapidly as possible to prevent lactic fermentation.

3. *The Fermentation of the Wort.*

After reducing the wort to the proper temperature it is transferred into the fermenting tubs, the required quantity of yeast added, and allowed to ferment. This fermentation may be of two kinds, as stated previously, surface or superficial fermentation, and sedimentary fermentation. Surface fermentation is more violent, of shorter duration, and takes place at a higher temperature than sedimentary fer-

mentation. The main change taking place in the wort during fermentation is the formation of alcohol and carbonic acid by the decomposition of the sugar. When this first fermentation is over, the new beer is usually put in large casks, placed in a cool cellar, where the so-called after fermentation takes place, which, according to the temperature and the amount of sugar still present in the beer, etc., may last for a long time, as in the case of lager beers.

The process of fermentation of the beer-wort, requires as much attention as all the other previously enumerated manipulations in the brewing of a good beer; in fact, from the moment the barley and the hops enter the brewery, till the beer made of them goes to the consumer the utmost attention has to be paid by the brewer at each succeeding stage in its manufacture.

Respectfully Submitted,

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GROUP IX.

CRUDE VEGETABLE AND ANIMAL DRUGS.

GROUP X.

PHARMACEUTICAL CHEMICALS AND THEIR PREPARATIONS.

By FREDERICK HOFFMANN, A. M., Ph. D.

MEDICINAL DRUGS AND CHEMICALS.

To the State Board of Health of New York :

Having been appointed by the State Board of Health of New York, to examine specimens of "Crude Vegetable Drugs" and "Pharmaceutical Chemicals and their Preparations," as presented to me by the chairman of the sanitary committee of the Board, I beg to present the following brief report on the results of my examination of 342 specimens of drugs, and of 317 specimens of chemicals, which were delivered to me on the 31st of October; the 7th and 16th of November, and the 1st of December. In consideration of the brief time granted for the present inquiry, for the necessary comparatively large amount of microscopical and analytical work, and for the delivery of the report, the inspectors were instructed, with the consent of the chairman of the sanitary committee of the Board of Health, to collect for the present examination, specimens of crude and of powdered drugs and of chemicals only; and of these such ones as are of importance, or which have been found wanting in quality according to recently published reports of analysts. As drugs and chemicals generally form the basis of pharmaceutical preparations, and as their good quality, therefore, is of prime importance, they have first been taken into consideration. The collection, as well as the examination of such extensive groups as the essential oils, and the whole series of pharmaceutical preparations proper, including the fluid extracts, the tinctures, the various solutions of salts, etc., for whose quality and strength the Pharmacopœia of the United States, and some other recognized Pharmacopœias are considered standards, require much more labor, time, apparatus and detailed methods for estimation, and considerably greater expenditure.

It is beyond the object and sphere of this report, to include and recite the known facts about the present condition of the drug trade, and about inferiorities and adulterations in drugs and medicinal chemicals, as found and published in the course of recent years in the current pharmaceutical and sanitary literature; nor to dwell upon, or advance suggestions in regard to needed or desirable measures of reform; it may, however, not be amiss in this respect, to refer to the elaborate "report on deteriorations, adulterations and substitutions of drugs," furnished by Prof. C. L. Diehl of Louisville, Ky., to the National Board of

Health, and published as supplement number six, among the publications of that Board.

It needs hardly to be stated that the examinations of drugs and chemicals has been conducted with the view to ascertain their identity and quality. These are liable to be impaired by accidental or intentional substitution, or by contamination resulting from want of knowledge, or care in the gathering and preparation of the drugs, or in the manufacture of chemicals, or from errors or carelessness in packing, storing and labelling; whilst the originally good quality may also have been lessened or destroyed by deterioration through moisture, exposure or age; and in chemicals also by incomplete or deficient methods of, or operations in, their manufacture, and through other accidental causes, and finally by fraudulent adulteration.

The methods employed for examination have been, in the case of crude and powdered drugs, a close and comparative inspection of their characteristic, physical properties and condition, their anatomical structure, etc., aided, whenever necessary, as particularly with powder and powdered drugs, by the use of a lens or of microscopes, and by comparison with microscopical standard preparations, as well as by chemical tests. With drugs, like wax and oil of cacao, well known empirical tests, resting mainly upon their greater or lesser solubility in solvents at certain temperatures, or upon other properties, have been used. For the examination of the chemicals, the most approved methods have been employed. Whenever required, or where different processes are applicable for the estimation of important chemicals, the one employed is indicated or described. A description, however, of the common and general chemical tests has been omitted, as such an elementary course would unduly enlarge this Report, would be superfluous to the expert and unavailing to the uninitiated, and would but be a written reproduction of what is stated in print in the *Pharmacopœia*, in "the National" and "the United States Dispensatories," and in Fr. Hoffmann's "Examination of Medicinal Chemicals."

As absolute purity in most medicinal chemicals and their pharmaceutical preparations is neither necessary, nor in many of them readily attainable, a certain margin has to be admitted and due allowance to be made, in all sharply defined chemical tests, for collateral and mostly insignificant and indifferent admixtures or remnants of solvents, or materials used or produced in the manufacture and preparation of chemicals. Traces of such co-incident impurities, therefore, are found and conceded in many commercial medicinal chemicals and their pharmaceutical preparations, but the experienced expert can readily and safely determine their amount and draw, with judicious discrimination, the proper line between the legitimate limit and the undue excess of any such impurity. * Their nature and character, moreover, have to be taken into

* This trust and privilege is likewise accorded to the expert pharmacist in countries, where the practice of pharmacy is restricted by protective grants, and stands under the control of the National Government, and where, as for instance, in Germany, the most efficient measure to reach inferiorities and adulterations in drugs, consists in periodical inspections of the pharmacies and dispensing establishments.⁵ This inspection is no lead letter, but is a severe, searching operation, performed, generally in one day, by a delegation nominated by the provincial government, and consisting of the department councillor of the provincial government, (*Regierungs Medicinalrath*), the district physician and the district or some other delegated apothecary. One or more representatives of the local municipal authorities are also invited to attend the inspection. The drugs, especially those liable to deterioration or sophistication, and all pharmaceutical and chemical prepara-

special consideration whenever the impurity, or its amount and nature in any way may be objectionable, either by their powerful properties, or by their lessening or modifying the therapeutical value and effect of the chemical. The tests and the proper standard for relative purity in chemicals, therefore, have been applied throughout with due care, and with reasonable allowance where admissible and justified, but with strict discrimination whenever required by the kind and nature of both, the chemical and the impurity.

For all such chemicals and pharmaceutical preparations which admit and require, and for which the Pharmacopœia has established a standard strength on the basis of a specified or otherwise well known and recognized chemical assay, this test has, in general, to be applied as the principal criterion.

CRUDE VEGETABLE DRUGS.

Seneca root, Root of *Polygala Seneca*, Linn. Twenty-three specimens, Nos. 1106, 1133, 1174, 1215, 1263, 1312, 1315, 1383, 1423, 1440, 1478, 1514, 1550, 1589, 1662, 1679, 1689, 1712, 1732, 558, 567, 585, 797. Eighteen specimens are true *Seneca* root of good quality; 1 specimen (No. 1423) is the same but of inferior quality; 1 specimen (No. 1106) contains about fifty per cent of good and true root, the balance being inert rootlets, stolones of a graminea and some foreign root; 1 specimen (No. 1174) contains about seventy-five per cent of good root, the balance being some inert rootlets; 1 specimen (No. 1514) is *seneca* root of a poor and evidently inert quality; 1 specimen (No. 1440) is worthless on account of deterioration and adulteration.

Virginia snake root, Rhizome and rootlets of *Aristolochia Serpentina*, Linn., and *Aristolochia reticulata*, Nuttall. Twenty-one specimens, Nos. 1107, 1134, 1175, 1216, 1264, 1316, 1349, 1384, 1441, 1424, 1479, 1515, 1551, 1590, 1627, 1663, 1680, 1699, 1713, 1733, 797. Twenty specimens are true *Virginia* snake root of fair quality; 1 specimen (No. 1216) are the rhizome and rootlets of *Asarum canadense*, Linn.

Sarsaparilla root, Root of *Smilax officinalis*. Humb. and Bonpl. Twenty-three specimens, Nos. 1108, 1135, 1176, 1217, 1295, 1317, 1350, 1385, 1425, 1442, 1480, 1516, 1552, 1591, 1629, 1665, 1682, 1700, 1715, 1735, 569, 585, 797. Nine specimens are true *Sarsaparilla* root of good

tions of the Pharmacopœia are examined and their quality and strength tested. Store, laboratory, storage rooms and cellar are inspected. Not only are the drugs and the stock examined, but also the assistants and apprentices; they are required to show the certificates of their preliminary education and subsequent studies, are examined on the pharmaceutical sciences, on practical pharmacy, and the pharmacopœia, and have to submit to an inquiry into their studies, diligence and progress. The inspectors examine the apothecary's diploma, license, library, herbarium, prescription books and the prices charged on prescriptions. A resume of the entire inspection is made and signed by all delegates and witnesses, and is sent to and kept by, the provincial government. From this the apothecary receives a report of the result of the inspection, with either acknowledging reflections counsels for his or his assistant's benefit, or polite but precise and firm reprimands.

The intercourse of the civil and judicial authorities with all citizens being dignified and polite, though strict, and regardless to position, means, rank or relations, the dealings of the authorities with the apothecaries are likewise characterized by consideration and respect. Like other professions, there is a great deal required from the apothecary, a high status of professional competency, fidelity and uncompromising reliability. In return the State grants him protection, and in ordinary life he enjoys, in common with the physician, the confidence and esteem of the community, by virtue of his vocation." (From: "Pharmacy in Prussia and the German Empire by Fred. Hoffmann." *American Journal of Pharmacy*, Vol. 43, page 388).

quality; 4 specimens (Nos. 1135, 1442, 1700, 569) contain more or less inert stolones of a graminea and rubbish; 2 specimens (Nos. 1715, 1735) are Sarsaparilla root of a poor quality; 2 specimens (Nos. 1385, 1480) consist of inert rubbish; 1 specimen (No. 1295) consists of an inert substitute without containing any Sarsaparilla root; 6 specimens (Nos. 1108, 1217, 1317, 1350, 1516, 1591) are altogether the rhizome of false Sarsaparilla (*Aralia nudicaulis*, Linn.).

Foxglove leaves, Leaves of *Digitalis purpurea*, Linn. Twenty-two specimens, Nos. 1136, 1177, 1218, 1266, 1351, 1378, 1386, 1443, 1481, 1426, 1517, 1553, 1593, 1630, 1666, 1683, 1701, 1716, 1736, 570, 587, 797. Twelve specimens are true Foxglove leaves of satisfactory quality; 10 specimens (Nos. 1177, 1266, 1351, 1481, 1517, 1630, 1666, 1736, 570, 587) are deteriorated by exposure and age.

Spanish saffron, The stigmas of *Crocus sativus*, Linn. Twenty specimens, Nos. 1110, 1138, 1178, 1219, 1268, 1319, 1352, 1427, 1445, 1483, 1555, 1595, 1631, 1684, 1718, 1738, 571, 572, 588, 797. Sixteen specimens, although called for and purchased as, and, excepted one specimen (No. 1738) labelled "Spanish saffron," are the florets of Safflower (*Carthamus tinctorius*, Linn.); 3 specimens (Nos. 572, 588, 797) are true Saffron of sufficiently good quality, the one (No. 572) containing some florets of *Calendula officinalis*, Linn.; 1 specimen (No. 571) is true Saffron, but completely exhausted and consequently worthless.

Myrrh, The gum-resin of several species of *Balsamodendron*. Twenty-one specimens, Nos. 1179, 1111, 1139, 1220, 1269, 1320, 1353, 1389, 1428, 1446, 1519, 1484, 1556, 1596, 1632, 1676, 1694, 1709, 1719, 1741, 797. Fifteen specimens of more or less good quality; 2 specimens (Nos. 1111, 1139) powdered myrrh of apparently good quality; 4 specimens (Nos. 1320, 1353, 1428, 1519) myrrh of inferior quality.

White wax. Seventeen specimens, Nos. 1112, 1140, 1180, 1122, 1270, 1321, 1354, 1390, 1429, 1447, 1485, 1520, 1557, 1597, 1633, 1638, 797. Eleven specimens are pure wax; three specimens (Nos. 1180, 1354, 1429) contain some paraffine, and three specimens (Nos. 1633, 1638, 797) contain some stearin.

Two tests employed in the examination of wax were:

1. For *stearin*. About 5 grains of the finely scraped wax were dissolved in a dry test-tube in one fluid drachm of chloroform; the clear solution was subsequently agitated with two ounces of lime water (Hager's test).

2. For *paraffin*. Two drachms of the finely scraped wax were exhausted at a temperature of about 100° F. with two ounces of benzine; this dissolves little wax but all paraffin, if such be contained in the wax. The benzine solution was evaporated in a porcelain capsule, and the residue, if such a one of any amount was left, was treated with concentrated sulphuric acid, which destroys the small amount of wax dissolved, and leaves paraffin unchanged; where present this was recovered from the charred refuse by fusing it and by repeated washing with hot water while still molten.

Oil of Cacao, The fat of the seeds of *Theobroma Cacao*, Linn. Nineteen specimens, Nos. 1114, 1141, 1181, 1222, 1271, 1322, 1555, 1391, 1430, 1448, 1531, 1558, 1598, 1634, 1667, 1685, 1720, 1739, 797. Thirteen specimens are sufficiently pure oil of Cacao; 6 specimens (Nos. 1181, 1271, 1355, 1391, 1598, 1667) contain more or less tallow or suet.

Björklund's test was employed. One drachm of the finely scraped oil of cacao was dissolved in a dry test-tube in two drachms of ether, taking care to replace the bulk of ether evaporated; when dissolved the test-tube was immersed into iced water; whilst pure oil of cacao separates completely in granules, the ether remains more or less turbid in accordance to the amount of other fats, generally tallow, if such are present as adulterants.

Quince seeds, The seeds of *Cydonia vulgaris*, Pers. Thirteen specimens, Nos. 1253, 1297, 1387, 1444, 1482, 1518, 1109, 1137, 1554, 1594, 1717, 1737, 797. Six specimens are quince seed of good quality, one specimen (No. 1137) is quince seed of poor quality, six specimens (Nos. 1297, 1554, 1594, 1717, 1737, 797) are largely adulterated with various admixtures.

Lycopodium, The sporules of *Lycopodium clavatum*, Linn. Fifteen specimens, Nos. 1143, 1273, 1324, 1323, 1373, 1450, 1459, 1560, 1600, 1677, 1695, 1710, 1722, 1737, 797, all true *lycopodium* of good quality.

Lupulin. The glands of the strobiles of *Humulus lupulus*, Linn. Eighteen specimens, Nos. 1144, 1184, 1224, 1274, 1325, 1357, 1394, 1432, 1451, 1487, 1524, 1561, 1601, 1635, 1696, 1723, 1743, 797. Eleven specimens are glands of good quality, one specimen (No. 1325) is of inferior quality, two specimens (Nos. 1524, 1696) contain an undue amount of powdered scales of the strobiles, and more or less of sand, three specimens (Nos. 1394, 1432, 1743) are worthless by deterioration, and also contain much of the powdered leaflets of the strobiles.

Arrow-root, The starch of the rhizome of *Marantha arundinacea*, Linn. Twenty specimens, Nos. 1115, 1142, 1182, 1223, 1272, 1323, 1354, 1392, 1431, 1449, 1486, 1522, 1559, 1599, 1635, 1668, 1686, 1721, 1740, 797. Twelve specimens are true arrow-root starch; two specimens (Nos. 1486, 797) contain some potato and corn starch; four specimens (Nos. 1142, 1323, 1635, 1721) contain much corn starch; one specimen (No. 1115) contains much corn and potato starch; one specimen (No. 1486) contains some potato starch; one specimen (No. 1559) contains largely corn and wheat starch.

POWDERED DRUGS.

The estimation of the purity and quality of most powdered vegetable drugs offers greater difficulties, since the methods for the detection of inferiorities and adulteration are less definite and established than is the case with unpowdered drugs, and since their adulteration consists not only in the admixture of cheaper foreign material, mostly starches, flour or cellulose of all kinds, but also and now pre-eminently, in the admixture of inferior brands of the same drug. The microscopical method of examination, therefore, has largely been made unavailing in recent years by shrewdly dispensing with the use of flour or starches as adulterants, once much practiced. Except such powdered drugs, which contain and whose therapeutical and commercial value rests mainly or wholly, on certain chemical constituents, and, therefore, can be ascertained in most of them, by chemical assay, as is the case with opium, cinchona bark and other drugs which contain alkaloids, pharmaceutical and chemical tests are either not applicable, or they are, for obvious reasons, unavailing or of questionable value, as, for instance, in powdered ipecac, whose percentage amount of pure emetia is both, too small and too variable, to

render a constant and reliable criterion; or in jalap, or other drugs containing resins or gum-resins, whose amount of soluble resin can readily be maintained by substitute in case of fraudulent exhaustion or adulteration. Empirical and comparative tests have, therefore, more or less to be resorted to for obtaining an approximately correct and reliable estimate of the quality of the powdered drugs, and these tests must be based and conducted, on a thorough knowledge of the physical characteristics of each drug and on a sufficient amount of skill, experience and unbiassed judgment of the expert.

Ipecac root. The root of *Cephaelis ipecacuanha*, Willd. Twenty-two specimens, Nos. 1127, 1147, 1211, 1227, 1278, 1310, 1329, 1360, 1397, 1435, 1454, 1490, 1507, 1565, 1604, 1638, 1646, 1669, 1689, 1704, 1726, 797. The specimens are all of good appearance, most of them rather too light in color and wanting in the characteristic odor and taste of best ipecac; a number of specimens (Nos. 1127, 1211, 1310, 1435, 1454, 1565, 1604, 1646, 1689, 1704) contain small admixtures of flour, or starch otherwise than that of ipecac.

Jalap root. The tuber of *Exogonium purga*, Benth. Twenty-two specimens, Nos. 1126, 1146, 1186, 1226, 1277, 1309, 1327, 1359, 1396, 1434, 1453, 1489, 1526, 1564, 1603, 1637, 1670, 1688, 1703, 1725, 1745, 797. The specimens are all of good appearance, but most of them are more or less wanting in the strength of the characteristic odor and taste of best jalap; a number of specimens (Nos. 1226, 1396, 1564, 1603, 1637, 1670, 1703, 1745) contain some admixture of flour or starch otherwise than that of jalap.

Orris Root. The rhizome of *Iris florentina*, Linn. Nineteen specimens, Nos. 1149, 1188, 1229, 1279, 1330, 1362, 1399, 1437, 1465, 1492, 1529, 1606, 1640, 1673, 1691, 1706, 1727, 1747, 797. Ten specimens are of good quality, four specimens (Nos. 1229, 1279, 1330, 1362) contain an admixture of corn starch; six specimens (Nos. 1399, 1606, 1673, 1706, 1727, 1747) contain evidently an admixture of some flour.

Rhubarb root. The root of species of *Rheum*. Twenty-three Specimens, Nos. 1118, 1148, 1173, 1187, 1228, 1280, 1305, 1328, 1361, 1398, 1439, 1455, 1491, 1528, 1566, 1605, 1672, 1690, 1705, 1730, 1739, 1750, 797. All specimens of good appearance, some of an unusual bright yellow color; one specimen (No. 1398) of inferior quality by exposure and age; five specimens (Nos. 1566, 1605, 1672, 1705, 1730) contain evidently admixtures of some flour or starch otherwise than that of rhubarb; one specimen (No. 1739) contains much admixtures of flour and starch.

Mustard seed. The powdered seed of *Sinapis alba* Linn. Twenty-four Specimens, Nos. 1230, 1281, 1331, 1343, 1388, 1400, 1466, 1493, 1189, 1150, 1530, 1567, 1607, 1641, 1117, 1675, 1693, 1708, 1731, 577, 579, 598, 797, 578. Ten Specimens are pure mustard; two specimens (Nos. 1117, 1150) the whole seed; twelve specimens (Nos. 1281, 1567, 1607, 173, 1577, 579, 598, 797, 1331, 1400, 1466, 1530) contain admixtures of more or less flour.

MEDICINAL CHEMICALS.

Benzoic acid. Seventeen Specimens, Nos. 1121, 1151, 1190, 1231, 1282, 1332, 1364, 1401, 1494, 1531, 1404, 1569, 1609, 1643, 575, 593, 797. All specimens of good quality.

Citric acid. Fourteen specimens, Nos. 1152, 1191, 1232, 1283, 1333

1365, 1402, 1467, 1495, 1532, 1570, 1610, 1644, 797. All specimens true citric acid; most of them contain traces or more, of sulphuric acid resulting from insufficient purification in the manufacture.

Tannic acid. Eighteen specimens, Nos. 1129, 1153, 1192, 1233, 1284, 1334, 1344, 1364, 1403, 1468, 1496, 1533, 1571, 1611. 1645, 573, 592, All specimens of good quality.

Gallic acid. Three specimens, Nos. 574, 594, 797. All specimens of good quality.

Sub-carbonate of bismuth. Twelve specimens, Nos. 1155, 1195, 1236, 1287, 1307, 1337, 1406, 1470, 1498, 1573, 1647, 797. All specimens of good quality.

Sub-nitrate of bismuth. Eighteen specimens, Nos. 1124, 1156, 1196, 1237, 1275, 1308, 1338, 1367, 1407, 1471, 1499, 1536, 1574, 1613, 1648, 584, 595, 797. All specimens of good quality.

Oxalate of cerium. Fourteen specimens, Nos. 1154, 1194, 1235, 1286, 1306, 1336, 1405, 1469, 1497, 1535, 1572, 1612, 1646, 797. All specimens of good quality.

Codeia. Seven specimens, Nos. 1193, 1234, 1285, 1335, 1404, 1534, 797. All good codeia, except one specimen (No. 1335) being sulphate of morphia, although labelled codeia.

Iodine. Twenty specimens, Nos. 1131, 1159, 1199, 1240, 1290, 1340, 1369, 1474, 1410, 1411, 1471, 1502, 1536, 1538, 1539, 1577, 1590, 1616, 1651, 797. All specimens of good quality.

Iodoform. Sixteen specimens, Nos. 1130, 1158, 1189, 1239, 1289, 1348, 1409, 1473, 1501, 1538, 1576, 1578, 1615, 1650, 797. All specimens of good quality.

Iodide of ammonium. Eleven specimens, Nos. 1200, 1241, 1291, 1370, 1411, 1475, 1503, 1540, 1578, 597, 797. Five specimens of Iodide of Ammonium of good quality; one specimen (No. 1291) damp; two specimens (Nos. 1200, 1540) yellow; three specimens (Nos. 1475, 1503, 1578) yellow and damp, from exposure.

Iodide of sodium. Three specimens, Nos. 1293, 1542, 797. All specimens of good quality.

Iodide of potassium. Seventeen specimens, Nos. 1125, 1191, 1201, 1242, 1292, 1341, 1371, 1412, 1476, 1504, 1541, 1579, 1617, 1652, 582, 596, 797. Fourteen specimens are of good quality, some (Nos. 1125, 1341, 1476) containing a little potassium carbonate, remaining from insufficient purification in manufacture. One specimen (No. 1579) contains a small admixture of bromide of potassium, whilst two specimens (Nos. 582, 596) are altogether bromide of potassium.

Cream of tartar. Fifteen specimens, Nos. 1116, 1162, 1202, 1243, 1294, 1342, 1372, 1413, 1477, 1505, 1543, 1581, 1618, 1653, 797. All specimens of good quality.

Saltpetre. Fifteen specimens, Nos. 1113, 1194, 1203, 1244, 1295, 1343, 1373, 1414, 1456, 1506, 1544, 1582, 1619, 1654, 797. All specimens, except three (Nos. 1441, 1456, 1582) in large crystals, are powdered or granular saltpetre of sufficient purity, the specimens in crystals are crude saltpetre and contain an undue amount of chlorides, of which only more or less traces are contained in the specimens in powder.

Tartar emetic. Fifteen specimens, Nos. 1120, 1163, 1204, 1246, 1294, 1344, 1374, 1415, 1457, 1507, 1545, 1583, 1620, 1655, 797. All specimens of sufficiently good quality.

Reduced Iron. Seven specimens, Nos. 1119, 1157, 1197, 1238, 1288,

1408, 797. Five specimens of sufficiently good quality; two specimens (Nos. 1119, 1197) oxydized by age and exposure.

Carbonate of Iron. Eight specimens, Nos. 1339, 1492, 1500, 1537, 1575, 1614, 1649, 797. All specimens of sufficiently good quality.

Nitrate of Silver. Fifteen specimens, Nos. 1132, 1167, 1199, 1207, 1248, 1347, 1377, 1417, 1461, 1511, 1548, 1586, 1633, 1658, 797. All specimens in crystals of sufficiently pure quality.

Oxide of Zinc. Fourteen specimens, Nos. 1169, 1209, 1259, 1306, 1348, 1379, 1421, 1463, 1513, 1550, 1588, 1625, 1666, 797. All specimens of sufficiently good quality.

Sulpho-carbolate of Zinc. Six specimens, Nos. 1170, 1210, 1302, 1464, 1626, 797. Five specimens of good quality; one specimen (No. 1210) is altogether sulphate of zinc.

Santonin. Fifteen specimens, Nos. 1168, 1208, 1249, 1300, 1378, 1420, 1462, 1512, 1549, 1587, 1624, 1654, 559, 589, 797. All specimens sufficiently pure santonin; some have turned more or less yellow, by exposure to sun-light.

Sulphate of Morphia. Sixteen specimens, Nos. 1165, 1128, 1205, 1246, 1297, 1304, 1345, 1375, 1416, 1458, 1508, 1546, 1584, 1621, 1656, 797. All specimens of good quality.

Muriate of Quinia. Two specimens, Nos. 1509, 797. Both of good quality.

Sulphate of Quinia. Nineteen specimens, Nos. 1123, 1166, 1209, 1247, 1298, 1346, 1376, 1418, 1460, 1510, 1547, 1585, 1622, 1657, 797, 599, 579, 580, 600. Two specimens (Nos. 580, 600) are altogether sulphate of cinchonidia; one specimen (No. 579) contains an undue amount of an admixture of lower cinchona alkaloids. The other specimens are of sufficient quality; they loose in drying at a temperature not exceeding 120° F., from 11 to 16 per cent of water of crystallization and moisture, and render all a more or less slight reaction of the lower cinchona alkaloids, with the pharmacopœial ether test.

In consideration of the fact that there are in the State of New York, according to reliable statistics, approximately not less than 2,800 drug-stores, and, besides, about 3,000 country and variety stores, where, among all sorts of merchandise, drugs and ready-made medicines are also vended, the number of specimens (659) obtained for the present examination represents a comparatively insignificant figure, altogether inadequate to serve for forming a correct inference, or an average estimate of, the quality and general character of drugs and medicines dispensed, at present, in our state. If, however, an opinion is desired on the basis and from the results of the present inquiry, it appears that the quality of medicinal chemicals dispensed in the few places wherefrom specimens have been provided, is a fair one, whilst this is less the case with the comparatively few specimens of crude vegetable drugs, as is particularly illustrated by the inferiority and substitution in such important remedies as digitalis, seneca, sarsaparilla, saffron, etc.

The specimens of powdered drugs, although mostly of good appearance, are evidently to a great extent, of unsatisfactory quality and questionable trustworthiness; many of them contain smaller or larger admixtures of starches or flour, and several, as for instance, ipecac, contain besides, when compared under the microscope, side by side, with standard preparations of the same drug, an undue amount of woody

fibre; many are more or less wanting in the strength of the characteristic odor and taste of the drug.

Powdered vegetable drugs, like many or most other pharmaceutical preparations, are not any more prepared by the pharmacists, and are generally bought bona fide. They unfortunately admit a wide scope for the disposal of commercial drugs of inferior, or deteriorated quality, as well as for adulteration, since the methods for the estimation of their purity and strength, as stated above, are less definite; and, with a few exceptions, rest mainly on the criterion of empirical tests.

In order to approximately realize the object of the present measure, and to secure a more commensurate and satisfactory estimate of the character and quality of drugs and medicines dispensed and vended for medication in our communities, a much more comprehensive and adequate collection of specimens, uniformly throughout all sections of the State, is necessary and should be organized. How to accomplish this in an efficient and at the same time, unobjectionable method, is a problem which offers no small difficulties and requires ampler grants for necessarily larger expenditures and increased labors. The present method appears to be at best, insufficient and unavailing, at least in respect to the collection of specimens of drugs and chemicals, and that the more so, as all the specimens collected by the appointed inspectors, for the present inquiry, were obtained from a few localities in only a few sections of the State.

This report would be incomplete if it would not take cognizance of that kind of modern medication, whereby drugs and chemicals are largely and indiscriminately dispensed and consumed in the form of ready-made secret preparations, commonly known as patent medicines; they have rapidly increased in number, and have become of much importance as articles of commerce. The trade lists of secret and proprietary medicines embrace at present, a much larger number of articles than all the legitimate preparations of the pharmacopœia, and, according to reliable statistics, it seems to be accepted as a fact, that presumably one-half of the medicinal drugs and chemicals consumed in the United States, enter into and are dispensed and consumed in, the form of secret and proprietary medicines. Large quantities of them are exported, whereas others of foreign make are imported. These medicines are vended everywhere in our State and country, without any restriction or control whatever, generally bearing upon their glaring wrappers and labels liberal medical advice, and pretentious claims as cure-alls for a long list of possible and impossible ailments, whilst they fail to add any statement about their composition both, in constituents and quantities.

Except the large class of so-called "Bitters," many of which are little more than whisky in disguise, nothing can be found out about these medicines from any established source of information. They stand outside of any authoritative recognition and control, are mostly made by irresponsible manufacturers and vended, beyond any responsibility either, of the maker or the retailer.

Much has been written about the extensive, indiscriminate and frequently reckless use and misuse, and the consequent injury and dangers of this kind of medications by medicines and preparations of unknown composition and qualities. A number of them have, from time to time, been analysed, and some have been found to contain potent drugs, the dispensation of which in such doses and for the specified purpose, or

the wide scope of application, would hardly be risked or approved in the practice of legitimate medication, while the nostrum-makers dispense them with the additional medical advice, unrestricted.

I deem it legitimate and proper, in conclusion, to briefly allude to this extensive and important trade in drugs and medicinal chemicals, which on account of its licentious and dangerous dispensation of potent drugs and medicines of unknown composition and qualities, under deceptive and unqualified names, advice and pretensions, remains as yet a problem among the needed sanitary reforms of our country.

GROUP XI.

GELATIN AND SUGAR-COATED AND COMPRESSED PILLS OF QUININE.

By GEORGE C. CALDWELL, Ph. D.

QUININE IN PILLS AND CAPSULES.

Literature and Analysis.

Work on this part of my division was not begun till quite late in the fall, for reasons beyond my control. The literature of the subject is very scanty indeed, and it does not appear that the large quinine consuming public of this country has any assurance whatever that it gets its two, three or five grains of sulphate of quinine in the pills, capsules and other preparations said to contain these quantities.

For want of time to do more I have confined myself to the simple determination of the amount of quinine sulphate in the samples received; and have not attempted to ascertain the extent to which other alkaloids of the bark are substituted for it, to make up the deficiency when it exists. To this end I have proceeded as follows: a number of pills or capsules representing from eight to nine grains of the sulphate, was put into a graduated tube holding about 60 cc., and digested in about 10 cc. of water acidified with sulphuric acid; complete solution of the entire substance of the pills was of course not always attained; but the quantity of acid added was amply sufficient to insure the solution of all the quinine. Ammonia was then added till the reaction was plainly alkaline, and thoroughly mixed with the liquid, and then about 40 cc. of ether; the tube was corked and its contents thoroughly shaken together as long as any further solution of the abundant white precipitate produced by the ammonia appeared to take place; the tube was then set aside for half an hour or till the ether became quite clear. Usually the aqueous liquid below the ether was simply slightly turbid; and the line of separation between it and the ether above was distinctly marked, but in some instances there was a glairy layer between, which in a very few cases occupied so much space that it was hard to estimate the real volume of the ethereal solution; but in all such cases I gave to the pills the benefit of the doubt. To take off the ether solution I put in the place of the cork, another one carrying two tubes like those of an ordinary wash bottle, with the mouth of the longer tube opening just above the surface of the aqueous layer; the total volume of the ethereal solution was noted, as well as of the small remainder left below the mouth of the exit tube; the solution was evaporated to dryness, the residue dried at 100°, the weight calculated for the whole volume of solution and multiplied by the factor 1.289 to get the corresponding weight of sulphate of quinine. Four tests of the process made with Powers and Wightman's sulphate of quinine proved it to be sufficiently accurate for the purpose in question.

According to *Van der Burg* (131) this extract may contain more than traces of quinine if present in notable quantities. On the other hand *Sestini* (122) found it to be impossible to precipitate quinia completely with ammonia or potash. What with the possible partial compensation of these two errors by each other, and the fact that quinia to some extent produces the same medicinal effect as quinine, although in a smaller degree, and the good results which I obtained with pure sulphate of quinine notwithstanding the difficulty which *Sestini* found, I think I am justified in considering that my results very fairly represent the quality of the samples received for examination.

The results are set forth in the following table; they show conclusively that the quantity of sulphate of quinine in pills and capsules usually falls short of the quantity claimed to be present by from 10 to 50 per cent.

Inspector's number.	Locality.	Stated contents of sulphate of quinine per pill in grains.	Contents found.		
			First trial.	Second trial.	Third
510.....	New York city....	2	1.7		
511.....	do	2	0.9		
1105.....	Jordan.....	2	1.3		
1171.....	Weedsport.....	2	1.6		
1172.....	do	2	1.8	1.7	
1212.....	Lyons.....	2	1.6		
1213.....	do	3	2.5		
1214.....	do	5	3.4		
1251.....	do	2	1.7		
1252.....	do	3	2.	2.4	
1254.....	Rochester.....	3	1.7	1.6	
1255.....	do	2	1.1	1.03	
1256.....	do	5	4.4	4.4	
1257.....	do	3	2.7		
1258.....	do	2	1.8		
1259.....	do	5	4.5		
1260.....	do	3	2.5		
1261.....	do	2	1.75	1.7	1.75
1262.....	do	2	1.7		
1303.....	Geneva	2	1.7		
1313.....	do	3	2.5		
1314.....	do	5	4.7		
1380.....	Herkimer	2	1.4		
1381.....	do	3	2.		
1382.....	do	5	2.4	2.1	
1422.....	Batavia.....	2	1.5		
1438.....	do	2	1.7		
1439.....	do	3	2.6		
1661.....	Norwich.....	3	2.8		

(131) *Van der Burg*. *Fres. Zeitschr.* 4, 1866, 276.

(122) *Sestini*. *Fres. Zeitschr.* 6, 1867, 363.

Not being satisfied with the results of the analysis of No. 1382, I requested Inspector Smith to procure another sample at the same place; it yielded 3.2 grains of sulphate of quinine per pill; but the dried residue of the etherial extract was evidently, from its appearance, not all quinine; it differed strikingly from the residue obtained with pure sulphate, and from the residue obtained with any other sample of pills examined. There was in the case of this sample as well as of numbers 1105 and 1422, a notable portion of the precipitate by alkali, that was insoluble in ether, indicating the presence in the pill of a quantity of some other alkaloid of the bark, doubtless either cinchonin or cinchonidine. The abnormal character of the residue of quinine, which was alike in all of the three analyses, indicates foreign matters, whose presence may account for the discordant results obtained in weight.

Fruit Essences.

The consideration of this subject was deferred till the other subjects included in my division, regarded as much more important, should have received due attention. Up to the time of the preparation of this report I have been unable to find opportunity to make any examinations of these substances, and I have only the following brief statement to offer.

The literature of the subject is exceedingly scanty. *Kletzinsky* (75a) gives recipes for the artificial preparation of the essences; the materials used are alcoholic solutions of ethyl acetate, formiate, butyrate, valerianate, cenanthate, benzoate, sebacate and salicylate; amyl acetate, butyrate and valerianite; of tartaric, succinnic, oxalic and benzoic acids, aldehyd and glycerine. Inspector Colby obtained from a leading druggists' firm in New York city several recipes, some of which are essentially the same as those given by Kletzinsky, with the addition, when the essence is to be colored, of tincture of safflower or sandalins, or of aniline red (free from arsenic). The inspector was informed that *genuine natural fruit essences are not in the market*. *Hager* (54) calls attention to the fact that although there are tests for the detection of these artificial essences, they are still sold; and he gives again certain reactions by which artificially colored imitations of red fruit essences can be detected.

(75a) Kletzinsky. *Dingl. Pol. Jour.* 153, 1859. 407; *Bulletin Soc. Chimique*, 6, 1866, 472, *Wurts, Dict. de Chimie*, T. 1.

(54) Hager. *Freie. Zeltschr.* 10, 1871, 284.

GROUP XII.

EFFERVESCENT MEDICINAL PREPARATIONS.

By WILLIS G. TUCKER, M. D., Ph. D.

To PROF. C. F. CHANDLER, *Chairman of Sanitary Committee* :

Under the head of "effervescing medicinal preparations" are included a large number of effervescing salts and compounds, many of which, however, are but little known and have but a limited sale. It was therefore deemed best to make an examination first of the two most important officinal preparations belonging to this class, both of them being well known and highly popular remedies which have long been largely sold and commonly employed, namely the SEIDLITZ POWDERS (*Pulveres effervescentes aperientes*, U. S. P.) and the SOLUTION OF CITRATE OF MAGNESIUM (*Liquor Magnesii Citratis*, U. S. P.) The sales of these two preparations in this State probably largely exceed those of all other effervescing preparations (used strictly as medicines) combined. Estimates were obtained from both wholesale dealers and manufacturers of the amount and value of these preparations sold *per annum* in this State but they differed widely and are not here stated. It is well known, however that they are very extensively sold, being largely prescribed by physicians and commonly employed as household remedies.

I. SEIDLITZ POWDERS.

These are officinal, having been introduced into the Pharmacopœia of 1850, and continued since.

Composition, etc. One powder, commonly enclosed in a white paper, contains 35 grains of powdered tartaric acid and the other, commonly wrapped in blue paper, contains an intimate mixture of 40 grains of bi-carbonate of sodium and 120 grains of the double tartrate of sodium and potassium or "Rochelle salt." When the contents of the two papers are separately dissolved in water and the solutions mixed the chemical reaction which takes place results in the formation of the neutral sodic tartrate and the liberation of carbonic acid gas, which aerates the mixture, while the Rochelle Salt is unchanged. The proportions in which these substances are directed to be employed are almost exactly those which insure the complete decomposition of the bi-carbonate, the chief use of which is to render the mixture effervescent, while the Rochelle salt, a gentle purgative, is the chief medicinal ingredient, although the sodic tartrate produced by the decomposition of the bi-carbonate, is not entirely inert. It is therefore seen that these proportions should be preserved, and that if they be widely departed from the powders become less valuable, inert or even harmful. Thus if the Rochelle salt be reduced in quantity while the amount of the bi-carbonate is increased without at the same time increasing the amount of tartaric acid, the medicine as administered consists largely of undecomposed bi-carbonate of sodium, so that instead of furnishing an aerated solution of neutral purgative salts, it consists largely of the alkaine bi-carbonate possessing no value as a cathartic and perhaps even operating injuriously.

Chief sophistications. Since the cost of Rochelle salt varies from 32 to 36 cents per lb. and that of the bi-carbonate of sodium but from four to six cents per lb. it is a not unusual practice to diminish the quantity of the former and increase that of the latter ingredient.

Some slight variation from the correct standard there will generally be since it is exceedingly difficult intimately to mix the two substances so as to render the composition of a batch of the powder perfectly uniform, but this mixture should be accomplished by proper machinery if the powders are made on a large scale and the proportions of the two ingredients ought not to vary far from the correct ratio of one to three.

Aside from this unwarranted alteration, powders are frequently sold which fall below the officinal weights. Slight errors will of course occur because these powders are ordinarily measured and not weighed but the variation ought not to be large.

Collection of samples for analysis. Seventy-two powders were examined of which 35 were received from New York from Mr. A. L. Colby, Inspector to the Board, and 37 were collected in Albany and vicinity.

Of those obtained in Albany and vicinity, one was sent to me by the Secretary of the Board, nine were collected in Albany by myself, ten in Albany by Mr. Ladue, a student of mine, at my request, and the remainder (17) by Mr. Ladue in Troy, West Troy, Green Island and Cohoes. All were properly recorded and numbered and in each case the portion remaining unused was bottled and preserved. These samples probably represent rather the better class of powders sold.

Examination—Average Weight (1). Tartaric Acid. The average weight of the samples received from New York, was 42.6 grains, being 7.6 grains above the prescribed weight. Of these, 5 were of the correct weight, 6 were under weight and 24 were over weight, the smallest powder weighing 25 grains and the largest 60 grains.

The average weight of the samples obtained in Albany and vicinity was 35 grains, being the correct amount, but of 36 samples only five were of correct weight, 18 being under weight and 13 over weight. The smallest weighed 18 grains and the largest 56 grains. The average weight of 71 samples was 38.7 grains. It seems probable that the amount of tartaric acid is often purposely increased for the sake of decomposing the excess of the bi-carbonate employed in the seidlitz mixture.

(2). *The seidlitz mixture.* The average weight of 35 samples obtained from New York was 162.5 grains or 2.5 grains over weight. The variation was considerable, not one weighing exactly 160 grains; 14 were under weight and 21 over weight, the smallest weighing only 90 grains, and the largest 206 grains.

Of the 36 samples collected in Albany and vicinity (one of the 37 being in bulk) the average weight was 143.7 grains, or about 11 per cent. below the prescribed weight; four only were of correct weight, 21 being under weight, and 11 over weight. The smallest weighed 63 grains and the largest 225 grains. The average weight of 71 samples was 153.1 grains.

Chemical examination. A qualitative examination was first made of each powder. The contents of the white paper was proved in every instance to be tartaric acid of good or fair quality. Almost all the samples showed, as would naturally be expected, traces of sulphates and varying traces of lead.

The "seidlitz mixture" contained in the blue papers was found in but three instances to be other than a mixture of Rochelle salt and soda. In one of these, labelled "Seidlitzine" sugar was added; a second contained a considerable quantity of the di-sodic carbonate and in the third the soda was omitted entirely, probably through mere carelessness. No make-weight nor any gross adulterant was detected in any of the powders save as here stated. The majority showed varying traces of sulphates, but in no instance was sulphate of soda found in such quantity as to indicate its intentional addition as an adulterant, as is said frequently to be the case, both with Rochelle salt and "seidlitz mixture." Traces of chlorides were generally present and also of lead in varying traces. Di-sodic carbonate was present in small quantity in five samples and in large quantity in one, as stated.

Quantitative estimation of hydrosodic carbonate in the Seidlitz Mixtures

This was determined by estimating the carbonic di-oxide in about four grammes of each powder by Fresenius and Will's method and in case a qualitative examination had shown no other constituent in decided quantity than soda and Rochelle salt, the amount of the latter was determined approximately by subtracting from the weight of the powder taken the weight of the soda calculated. The ratio was then determined by dividing the weight of the Rochelle salt thus obtained by the weight of soda present. Since good articles of commercial bi-carbonate were found to yield from 94 to 97 per cent, of real hydro-sodic carbonate five per cent. was added to the amount of this constituent calculated.

Results. Thirty-five samples from New York gave a ratio of soda to Rochelle salt of 1 : 2.49, while 35 from Albany and vicinity gave a ratio of 1 : 2.63, the correct officinal proportion being 1 : 3. The average of 70 samples was 1 : 2.56. Calling a variation in the proportion, of Rochelle salt to soda, of from 2.8 to 3.2 of the former to one of the latter as fairly allowable we find that in the 70 samples examined 35, or 50 per cent., fell below the ratio of 2:8 : 1, the lowest ratio being 1.05 : 1 or nearly equal parts of each constituent. 31 or 44 per cent. gave a ratio of between 2.8 and 3.2 to one and only 4 of over 3.2 to one, clearly showing that this variation is by no means accidental, but evidently the result of an intentional alteration in the proportions of the ingredients employed.

Conclusions concerning Seidlitz Powders.

(1) Make-weights and gross adulterants are probably uncommon since they were detected in but 2 out of 72 samples.

(2) The weights of both the acid and seidlitz mixture showed a great diversity, being in some instances less than half, and in others nearly twice the correct amounts. Nevertheless the average of the 72 samples was in the case of the acid above the officinal amount, while in the case of the seidlitz mixture it was about 5 per cent below. These variations are undoubtedly due in many instances merely to careless measuring instead of careful weighing, but in many other instances the powders are undoubtedly manufactured of short weight.

(3) The ratio in which the constituents were present in the seidlitz mixtures was in at least one-third the samples too low to be accounted

for save by intentional decrease in the amount of Rochelle salt and increase in the amount of soda. Such a disproportion annuls or materially lessens the efficacy of the powders for the purpose intended.

II. SOLUTION OF CITRATE OF MAGNESIUM.

This is also an officinal preparation, having been introduced into the Pharmacopœia of 1850, and continued in those of '60 and '70, the formula having been changed in each instance. The preparation is a highly popular one and is largely sold, more particularly in cities and large towns. To be "officinal" it should be prepared by the process prescribed in the pharmacopœia of 1870, although this, like those which had preceded it, is open to some objections, the chief being that after standing for same time the solution deposits a granular precipitate of magnesian citrate. Probably this difficulty cannot be obviated except by diminishing the amount of carbonate of magnesium employed in its manufacture.

Sophistications. In order to obtain a clear, unalterable, saleable solution and also to lower the cost of manufacture, an effervescing solution of sodium tartrate, made in various ways, sweetened with simple syrup and flavored with essence of lemon to simulate the real citrate, is frequently sold in its stead and under its name.

Collection of Samples. Nine samples were received from Mr. Colby, having been collected in New York city. Five samples were purchased for me by Mr. Ladue in Troy, West Troy and Cohoes.

Chemical Analyses. These, owing to lack of time on my part, were kindly made for me by my friend and colleague, Dr. Maurice Perkins, Professor of Chemistry in Union College.

Results. Of the 9 samples received from New York, 6 contained magnesian citrate, potassic citrate (potassic bi-carbonate being added in bottling and just before corking, to cause effervescence) and free carbonic acid. These contained no tartaric acid and may be considered genuine; 3 consisted mainly of a solution of sodic tartrate and contained no magnesia nor citric acid. Quantitative determinations of most of the constituents were made.

Of the 5 samples obtained in Troy and vicinity, 2 consisted of a solution of magnesian citrate, etc., and were considered genuine, while 3 were solutions of sodic tartrate and contained no magnesia nor citric acid. Of the 14 samples examined 6 were therefore spurious, from which it would appear that the preparation sold under the name of the "Solution of Citrate of Magnesium" is frequently sophisticated.

Respectfully submitted,

W. G. TUCKER.

LABORATORY ALBANY MEDICAL COL- }
LEGE, ALBANY, December, 1881. }

NOTE.— In closing this series of reports of the first few months' results of work performed by the Analysts of Food and Drugs under the new law, the Chairman of the Standing Committee having supervision of these duties has been constrained to postpone his separate report upon GROUP I,— Milk,— until the second series of reports by the analysts is called for by the Board. Yet in his general statements relating to the organization and progress of duties under the new Law, he has presented important facts which show in what directions his investigations of Milk questions are progressing. (See pages 501, 502 and 503.) The urgency of duties in the general supervision of chemical work for this Board, added to other labors, has merely deferred the completion of Prof. Chandler's separate report upon GROUP I.

It is found necessary, also, to defer the printing of the reports upon the Hygiene of Tenement Houses, the West Troy Water-supply, the present state of evidence relating to Small-pox and Vaccination, and the production of Bovine Virus, and the description of the Malarial Regions in the State. All of these papers comprise illustrations and the results of much careful investigation. They will appear in the Board's Third Report.

E. M. MOORE, *President.*

ELISHA HARRIS *Secretary*

STATE BOARD OF HEALTH OF NEW YORK.

BUREAU OF CHEMICAL ANALYSIS TO PREVENT ADULTERATION OF FOOD AND DRUGS.

CATALOGUE

OF

THE LITERATURE OF THE CHEMISTRY OF FOOD AND DRUGS.

PREPARED BY ALBERT L. COLBY, PH. B.

A Catalogue for the use of the Analysts and Inspectors under the State Board of Health of New York.

I. GENERAL WORKS.

1. FOOD AND DRINK.

JOURNALS RELATING TO THE ADULTERATIONS OF FOOD AND DRINK, AND THEIR DETECTION.

Proceedings of the Society of Public Analysts. 8vo. 248 pp.
Vol. I. London, 1876. Now merged into the Analyst.

The Analyst, including the Proceedings of the Society of Public Analysts. London. 8vo. Monthly. Vols. I-VI. 1877 to date. This is the official journal of the Society of Public Analysts of Great Britain. It contains a full report of their proceedings, and gives the latest intelligence in regard to the methods of detecting adulterations.

The Food Journal. London. 8vo. Monthly. 4 vols. 1870-1874.

Food, Water, and Air, in Relation to the Public Health. Conducted by Arthur Hill Hassall. London. Quarto. Monthly. Vol. I. 1872- —.

The Sanitary Engineer. Vols. I-IV. New York. 1877 to date (weekly since 1882).

Jacobsen, E.: Chemisch-technisches Repertorium. Mittheilgn. d. neuesten Erfindgn. u. Fortschritte auf d. Geb. d. techn. u. industr. Chemie. Jahrg. 1862-78 u. Register üb. Jahrg. 1-15. 1862-80.

Zeitschrift f. Untersuchung von Lebensmitteln u. Verbrauchs-Gegenständen. Hrsg. v. Biechele. Jahrg. I-III. 1878 bis 1880.

Repertorium der Analytischen Chemie: für Handel, Gewerbe und öffentliche Gesundheitspflege. Organ des Vereins analytischer Chemiker. Erster Jahrgang, 1881.

Schäfer, Th.: Wider die Nahrungsfälscher: Zeitschrift. Organ des Untersuchungsamtes für Lebensmittel etc. Hanover, 1878.

Zeitschrift für Analytische Chemie. Dr. C. Remigius Fresenius. Wiesbaden. 8vo. Quarterly. Vols. I-XX. 1862 to date.

ENGLISH PARLIAMENTARY REPORTS RELATING TO THE ADULTERATIONS
OF FOOD AND DRINK, AND THEIR DETECTION.

First Report from Select Committee on Adulteration of Food, etc., with Minutes of Evidence and Appendix. 1855.

Second Report from Select Committee on Adulteration of Food, etc., with Minutes of Evidence and Appendix. 1855.

Index to Reports from Select Committee on Adulteration of Food, etc., with Minutes of Evidence, Appendix, and Index. 1856.

Report from Select Committee on Adulteration of Food, etc. 1872. With Minutes of Evidence and Appendix. 1874.

MONOGRAPH VOLUMES RELATING TO THE ADULTERATIONS OF FOOD AND
DRINK, AND THEIR DETECTION.

[Arranged According to Date of Publication.]

Accum, Frederick: A Treatise on Adulteration of Food and Culinary Poisons. 8vo. Pp. 344. London, 1820. This work is mainly interesting as being the first attempt, in English, of a systematic presentation of the subject. It is generally referred to as "Death in the Pot," from the wood-cut on the title page.

Cutbush: Lectures on the Adulteration of Food and Culinary Poisons. Newburg, 1823.

Pereira, Jonathan, M. D.: A Treatise on Food and Diet, with observations on the dietetical regimen suited for disordered state of the digestive organs, etc. 8vo. 542 pp. London, 1843.

Garnier: Des falsifications des substances alimentaires, et des moyens de les reconnaître. Paris, 1844.

Beck, Lewis C., M. D.: Adulterations of Various Substances used in Medicine and the Arts. 8vo. 322 pp. New York, 1846.

Duflos, Dr. Adolf: Die wichtigsten Lebensbedürfnisse, ihre Aechtheit und Güte, Verunreinigungen, Verfälschungen, etc. 8vo. 390 pp. Breslau, 1846.

Mitchell, John: Treaties on the Falsification of Food. 8vo. 330 pp. London, 1848.

- Moleschott, Jac. :** Lehre der Nahrungsmittel für das Volk. 8vo. 256 pp. Erlangen, 1853.
- Hassall, Arthur Hill, M. D. :** Adulterations detected in Food and Medicine. 1st edition. London, 1854. This work is out of print and very difficult to obtain. The engravings, being the first impressions from the blocks, are much sharper than in later editions.
- Bureaux :** Histoire des falsifications des substances alimentaires. Paris, 1855.
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- Hassall, Arthur Hill, M. D. :** Food and its adulterations, comprising the reports of the Analytical Sanitary Commission of the Lancet, for the years 1851-1854, inclusive, revised and enlarged. Illustrated by 159 engravings. 8vo. 659 pp. London, 1855.
- How :** Adulteration of Food and Drink. London, 1855.
- Klencke, Dr. :** Die Nahrungsmittelfrage in Deutschland. 8vo. 173 pp. Leipzig, 1855.
- Chevalier :** Dictionnaire des altérations et falsifications des substances alimentaires, médicamenteuses et commerciales, avec l'indication des moyens de les reconnaître. Paris, 1856.
- Dodd, Geo. :** The Food of London. 8vo. 524 pp. London, 1856.
- Marset :** Composition, Adulteration, and Analysis of Food. London, 1856.
- Payen :** Substances alimentaires. Paris, 1856.
- Dalton :** Adulteration of Food. London, 1857.
- Klencke, Hermann :** Die Verfälschung der Nahrungsmittel und Getränke, etc. 8vo. 1099 pp. Leipzig, 1858.
- Petit, Lafitte :** Instruction simplifiée pour la constatation des propriétés des altérations et des falsifications des principales denrées alimentaires. Bordeaux, 1858.
- Friedrich :** Die Verfälschung der Speisen und Getränke. Münster, 1859.
- Gerhardt :** Précis d'Analyse pour la recherche des altérations et falsifications des produits chimiques et pharmaceutiques. Paris, 1860.
- Brinton, William, M. D. :** On Food and its Digestion, being an introduction to Dietetics. 8vo. 485 pp. London, 1861.
- Hassall, Arthur Hill, M. D. :** Adulterations detected in Food and Medicine, or plain instructions for the Discovery of Frauds in Food and Medicine. 8vo. 712 pp. 2d edition. London, 1861.

- Haskins, T. H., M. D.:** What we eat, and an account of the most common adulterations of food and drink, with simple tests by which many of them may be detected. 8vo. 218 pp. Boston, 1861.
- Muller, A.:** La composition chim. d'aliments représ. en tableaux coloriés. Brux., 1862.
- Normandy, A.:** The Commercial Hand-Book of Chemical Analysis. 8vo. 640 pp. London, 1865.
- Lancaster, Edwin, M. D.:** Good Food, What it is, and How to get it. 8vo. 64 pp. "Household Manual." London, 1867.
- Cameron, C. A.:** Chemistry of Food. London, 1868.
- Letheby, H.:** On Food, its varieties, chemical composition, nutritive value, comparative digestibility, physiological functions and uses, preservation, adulteration, etc., being the substance of Four Canton Lectures. 8vo. 277 pp. London, 1870.
- Cameron, C. A.:** A handy book on Food and Diet in health and disease. London, 1871.
- Dobell, Horace, M. D.:** On Diet and Regimen in sickness and health. 5th edition. London, 1872.
- Letheby, H., Ph. D.:** On Food, its varieties, chemical composition, nutritive value, comparative digestibility, physiological functions and uses, preparations, culinary treatment, preservation, adulteration, etc. 8vo. 255 pp. 2d edition. New York, 1872.
- Vogel, A.:** Nahrungs- und Genussmittel aus dem Pflanzenreiche. Wien, 1872.
- Hager, H.:** Untersuchungen. Handbuch d. Untersuchgn., Prüf. u. Werthbestimmung aller Handelswaaren, Natur- u. Kunsterzeugnisse. Leipzig, 1873.
- Lancaster, E.:** On Food. 2d edition. London, 1873.
- Parkes, Dr. E. A.:** Practical Hygiene. Edited by F. S. B. François de Chaumont, M. D. 8vo. 733 pp. 5th edition. Philadelphia, 1878. Contains two chapters on Food, Beverages, and condiments, with modes of detecting adulterations; numerous wood-cuts.
- Smith, Edward:** Hand-book for Inspectors of Nuisances. Contains full text of English laws on food and its adulteration. London, 1873.
- Smith, Edward:** Foods. London and New York, 1873.
- Atcherly, Rowland J., Ph. D.:** Adulterations of food, with short processes for their detection. 8vo. 112 pp. London, 1874.

Baltzer, L. : Die Nahrungs- und Genussmittel der Menschen in ihrer chem. Zusammensetzung und physiolog. Bedeutung. Nordhausen, 1874.

Lanel : Guide pratique pour reconnaître les falsifications et altérations des substances alimentaires. Paris, 1874.

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Soubeiran, J. Léon. Nouveau Dictionnaire des falsifications et des altérations des aliments, des médicaments, etc. 8vo. 634 pp. Paris, 1874.

Thiel, Dr. Carl Eugen : Nahrungs- und Genussmittel als Erzeugnisse der Industrie. 8vo. 198 pp. Braunschweig, 1874.

Dammer : Kurzes chem. Handwörterbuch. 1875.

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Bolley : Handbuch der technisch-chemischen Untersuchungen. 4te Auflage, ergänzt und bearbeitet von Prof. Dr. Kopp. Large 8vo. Leipzig, 1876.

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Bauer, Max : Die Verfälschung der Nahrungsmittel in grossen Städten, speciell Berlin und die Abhülfe dagegen vom gesetzlichen, gesundheitlichen und praktischen Gesichtspunkte. 8vo. 136 pp. Berlin, 1877.

- Birnbaum, K.** ; Einfache Methoden zur Prüfung wichtiger Lebensmittel auf Verfälschungen. Karlsruhe, 1877.
- Chevallier, A., et E. Baudrimont** : Dictionnaire des altérations et falsifications des substances alimentaires, médicamenteuses et commerciales, avec l'indication des moyens de les reconnaître. 8vo. 5th edition. Paris, 1877.
- Focke, Ed.** : Massregeln gegen Verfälschung der Nahrungsmittel. Chemnitz, 1877.
- Hausner, A.** : Die Fabrication d. Conserven u. Conditen. Leipzig, 1877.
- Kensington** : Analysis of Foods. This is quite a full collection of the analyses of various kinds of food. London, 1877.
- Löbner, A.** : Massregeln gegen Verfälschung der Nahrungsmittel. Chemnitz, 1877.
- Mierzinski, Lt.** : Die Conservirung d. Thier- u. Pflanzenstoffe (Nahrungsmittel, etc.). Berlin, 1877.
- Schnacke, Georg** : Wörterbuch der Prüfungen verfälschter, verunreinigter und imitirter Waaren, mit Angabe d. Wesens und der Erkennung der Aechtheit der Waaren. Jena, 1877.
- Averbeck, H.** : Die Verfälschungen d. Nahrungs- und Genussmittel. Bremen, 1878.
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- Elsner, Fr.** ; Untersuchgn. v. Lebensmitteln u. Verbrauchsgegenständen. 1878.
- Fox, C. B.** : Sanitary Examinations of Water, Air, and Food. London, 1878.
- Klencke, Dr. Hermann** : Illustriertes Lexicon der Verfälschungen der Nahrungsmittel und Getränke. 8vo. Leipzig, 1878.
- Schmid, Dr. Werner** : Anleitung zu sanitärisch- und polizeilich-chemischen Untersuchungen. 8vo. 192 pp. Zürich, 1878.
- Wittstein, G. C.** : Taschenbuch der Nahrungs- und Genussmittel-Lehre. 8vo. 176 pp. Nördlingen, 1878.
- Allen, Alfred H.** : Commercial Organic Analysis. Vol. I. Cyanogen compounds, alcohols, and their derivatives. Phenols, acids, etc. 8vo. 360 pp. Philadelphia, 1879.
- Blyth, A. Wynter** : A Manual of Practical Chemistry; the Analysis of Foods and Detection of Poisons. 8vo. pp. 468. London, 1879.
- Bolley** : Handbuch der technisch-chemischen Untersuchungen. Large 8vo. Latest edition. Leipzig, 1879.

- Caldwell, Prof. G. C. :** Agricultural Qualitative and Quantitative Chemical Analysis. 8vo. 307 pp. New York, 1879.
- Dietzsch, Oscar :** Die wichtigsten Nahrungsmittel und Getränke, deren Verunreinigungen und Verfälschungen. 8vo. 252 pp. Zürich, 1879.
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The analysts employed by the State Board of Health, and all other persons concerned in preventing adulteration and harm of food and articles used as medicine, must have as complete information as possible concerning the results of scientific investigation of these matters.. As no complete lists of these important volumes, journals and contributions existed in suitable forms for common reference by analysts and inspectors, it has been a laborious duty of the Sanitary Committee and the experts who have been engaged in this branch of the board's work, to prepare adequate lists of the literature examined by them and found available for useful reference. These bibliographical lists are printed in connection with the several reports of the analysts for the benefit of all sanitary authorities.

E. H. *Secretary.*

SECOND ANNUAL REPORT OF THE STATE BOARD OF HEALTH.

INDEX.

	PAGE.
Abandoned canals.....	2, 21, 30, 298-295
Adulteration of food and drugs, law to prevent.....	17
reports on.....	18, 497
Agnew, Dr. Cornelius R., on contagious diseases of the eyes in schools.....	225-238
Albany, city of, schools in.....	158-163
Allentown, Pa., communication from Mayor in reference to small-pox.....	90
Analysts, employed to examine water supplies.....	55, 427
Argyle, successful results of vaccination in.....	66
Auburn, sewerage and sanitary wants of.....	50
Batavia, drainage and sewerage required in.....	28
Bath-on-Hudson, schools in.....	164
Barren Island, nuisances, etc., upon.....	361
Beach, Eugene, report of small-pox in poor-house of Fulton county.....	79-81
Birth, its registry, why necessary.....	37
Boards of health of cities.....	10, 11
of towns.....	6, 11, 12
of villages.....	11
Bovine virus, why used.....	5-6, 61, 270
Board's action to provide.....	61, 62
Briggs, A. H., Health Physician, report of small-pox from immigrants at Buffalo	86
Brockport, school-houses in.....	152, 218, 220
Brooks, Hon. Erastus, chapter by, on duties of the citizen to the State concerning health.....	391-400
Buffalo, diseases in.....	10
sewage nuisance in.....	30
Bureau, Central, of Vital Statistics.....	35, 76
Canals, abandoned and miasmatic. <i>See</i> Abandoned Canals.	
Canal, causes of sickness along the Erie.....	10
Castleton, Richmond county, disease-chart of, facing.....	96
District School No. 4, example of defects in, and reform of.....	105
Carroll, Dr. A. L., reports.....	9, 28, 95-110
Causes of disease.....	3, 82
Cellars, wet.....	32
Census.....	10
Chandler, Prof. C. F.....	48, 54, 72, 75, 274
Chemists, payments to.....	73
appointment of, under chapter 407.....	56
reports of.....	427

Chemung canal	80
Chicago conference, action in reference to small-pox	87-89
Circulars of information	4, 112-129
Cities, public health service in	11
city boards of health	16
Clerks of towns and villages, duties of, in the registry service	39, 77
Closets, water, for schools	148, 155
Clothing, disinfection of	116
Cohoes, city of, schools in	165
Colby, Albert L.	377
Committee reports. 2, 4, 18, 68-75, 76-78, 127-129, 235-274, 281, 427	
Conclusions concerning school-houses	185-187
Coney Island, action to prevent nuisances near	53, 355
Contagious diseases, rules to suppress and prevent... ..	121
sanitary control of	406-409
refuges and temporary hospitals for	411-416
Contagion, kinds of, prevalent	2, 3, 4, 33
Coolley, Dr. J. S., report of diphtheria in Johnsburgh	91-92, 94, 111
Courts, procedures of, on health questions	405
Attorney-General Russell's advice and opinion upon	406
Croes, Engineer J. J. R., report on malarial district in Cortlandt.....	296-298
report on miasmatic nuisances at Croton Falls	299
report on miasmatic nuisances at New Rochelle	300
Croton Falls, drainage at	28, 53, 298
Death, its registry, and the record of causes	39
Delavan, Dr. J. S., reports as chairman	76-78, 337-390
Diphtheria	2, 4, 6-7, 44, 90-95, 106, 112-114, 116
Diseases, prevalent, records of	2, 9, 33, 78-111
contagious, of eyes	225
preventable	395
Disinfection	4, 116, 117, 118-120
District schools in the towns	149-152
Drainage, laws	2, 25
areas	2, 28, 29
obstructions to	2
act of 1869	27, 281
English laws for	27
bad, of school-houses	226
sewerage and topography, committee on	19, 281
Duties of citizens to the State	391-400
Dwelling-grounds and village sites	28
Dysentery and other diarrhoeal diseases	9, 10, 117
Earth-closets and dry removal	155, 156, 412
Effluvium nuisances	20-22, 51, 337-390
Eighth section of the State Board act, procedures under	19, 337-360
Eighteen-Mile creek, affidavits, inspection and reports concerning	63
Elliott, A. H., investigations of tests of oil by	58, 447-491
Emigrant trains, small-pox on	85-89, 253
Endemic diseases, Dr. Carroll's notes on	95-110

	PAGE.
English local government, sanitary improvement loans, etc.....	29
Epidemics, house	10, 81, 83, 89, 90, 92, 95
Erie canal, drainage of swamps and stagnant waters near	302
Executive and Finance Committee, reports of.....	18, 68-75
Excremental matters, disposal of	29, 156, 327-412
Experts, expert services.....	2, 42, 70, 71
Eye-sight of school children	186, 209
Fertilizer factories of superphosphates, nuisance of	19, 22, 341, 348, 353, 368, 381
Fevers	3, 29, 101, 107-110, 111
report on typhus in New York city	275-280
Finance, reports of committee on.....	68-75
Food and drugs, action of the Board under chapter 407.....	56
Forms in the registry of vital statistics.....	36, 40
Fort Edward, successful results of vaccination in	5, 69
Fulton county poor-house, small-pox in	79-81
Gardiner, James T., observations abroad upon sewerage	54, 321-334
Genesee Valley canal, miasmatic nuisances in bed of	20, 56, 284-296
General Drainage Act, need of.....	27, 382
Glens Falls and Queensbury, small-pox in	5, 88-85
Governor, orders of, etc., under section 8 of chapter 322.....	23, 295-296, 352, 358
Green Island, public schools of	178
Groveland, petition from, concerning abandoned canal nuisance in	285
Guaranty of petroleum refiners to abate and prevent nuisances.....	22, 360-363
Hamburgh Street canal, in Buffalo, nuisance of.....	30
Health officers.....	13, 15
forms of complaint by local health officers.....	402-406
Health in schools	43, 185-225
duties of citizens in maintaining it	391
economy of.....	398
Health Officer of the Port, reports and suggestions by.....	57, 234-274
Heating and ventilation of school-houses	130-131, 192
Homes, the hygiene of	2, 396
Hospitals, temporary, for contagious diseases	85, 411-415
Hudson, city of, and its sewerage.....	28, 49, 53
Hunt, Dr. James G., Health Officer and Commissioner, motion of, concerning nuisances.....	59
report as chairman of Committee on Public Institutions	127-129
Hunter's Point, nuisances of.....	19, 20, 21, 337
Hygiene of public schools, circular relating to.....	13, 129, 185
Illustrations, of plans of school-houses.....	134, 143, 144, 146, 148, 149, 150, 155, 156, 158, 160, 162, 163, 167, 170, 171, 176, 180, 194, 195, 196, 198, 201, 208, 211, 221
in reports on diseases.....	95, 96, 102, 103, 294, 297, 306, 412, 413
in engineers' reports.....	289-290, 294
in reports upon effluvium nuisances.....	384, 387
relating to safety testing of kerosene, 456, 460, 465, 467, 470, 472, 475, 479, 481, 494	
of parasites in flesh food.....	551
of the report on baking powders and cereal foods, 575, 576, 577, 578, 579, 580, 581, 582, 583	
of the report on sugars and glucose.....	608

Immigrants, contagions by.....	33, 55, 57, 101, 118, 253, 266
Inspection, sanitary.....	9, 43, 354, 361
Inspectors, of samples of food and drugs, appointment of and their duties....	56
	501-503
Institutions, public, report of committee on.....	127-194
Isolation and domestic quarantine.....	4, 84, 113-126
Janes, Dr. E. H., report on typhus fever in New York city.....	275-280
Johnstown, small-pox in, report of health officer.....	81-83
Johnsburgh, Warren county, diphtheria in.....	91
Kerosene. <i>See</i> Petroleum, Oil testing, etc.	
Kill-von-Kull, nuisance in.....	52, 108
Kingsbury and Sandy Hill, successful vaccination, to protect.....	5, 67
Kuichling, Emil C. E., services and reports by.....	61, 287-291, 306-320
Lake George, diphtheria in.....	94
Lake, Seneca, level of.....	54
Lansingburgh, public schools in.....	174
Lavatories in schools, bad or wanting.....	226
Laws, general, relating to health and registration.....	1, 2, 417-425
relating to small-pox and vaccination.....	23
for sanitary and general drainage.....	25
suggested, for preventing nuisances on State property.....	21
to establish State Board of Health.....	422
Leicester, petition of Board of Health in.....	293
drainage of abandoned canal in.....	58, 293
Library, books, maps and charts.....	71, 74
Lighting, defective, in schools.....	140 <i>et seq.</i>
Lincoln, Dr. David F., expert in school hygiene, inspects and reports, 18, 45, 64	
	189-233
Local boards of health.....	2, 18, 417-421
Lockport, small-pox in, and success of vaccination in.....	89-90
McGregor, Dr. W. W., Glens Falls, small-pox hospital report by.....	85
Malaria, extent of its areas.....	2, 303, 304, 305
near villages.....	16, 30
preventable causes of, in the State.....	31, 296-301
Manure, why and how to prevent nuisance from.....	52
Maps, of Lake George.....	95
sanitary, of Staten Island, facing.....	96
Newtown Creek district, facing.....	384
of oil-traps, facing.....	387
Mariners' Harbor, typhoid fever and measles in.....	101
Marshes.....	8, 26. <i>See</i> Swamps.
Marriage, its registry.....	38, 76
Memorandum on investigation of stench nuisances.....	366
Memphis, sanitary lessons in.....	327, 328, 329
Metropolitan Health Act.....	17
Board of Health.....	371
Miasmatic diseases.....	3, 305. <i>See</i> Malaria.
Minerva, Essex county, diphtheria in.....	93-94
Minutes of meetings and transactions of the State Board.....	49-67
Moore, Dr. Edward M., President, vote of thanks to.....	59
Mount Morris, drainage of abandoned canal in.....	58, 293

National Board of Health	4, 57, 259
New Jersey, communications to, concerning nuisances, etc.	52
New Rochelle, petition and action for abatement of nuisance.	58, 64
Newtown creek, nuisances of.	19, 20, 359, 364, 365
Notes and conclusions upon inspection of school-houses.	185-187
Oak Orchard creek, basin and swamps.	19
Oils, inflammable, methods of testing.	449-496
law regulating standard.	492
Oscawana Island, causes of malaria on and near.	28
Overcrowding in schools.	226
Paupers and the poor, from sickly children.	238
Peck, Dr. M. R., report of small-pox in Glens Falls.	85
Peekskill, its union school-house.	180
Penalties imposed under sanitary laws and regulations.	84
Petroleum, study of safety standard flash test.	61, 375, 449-496
law to regulate the standard in the State of New York.	492
test instruments and regulations adopted by the State Board of Health of New York.	493-496
Pollution of wells and streams.	2, 24
epidemics of diarrhoeal disease from.	24
Population, distribution, and local sanitary government.	10-12
Postage, expressage and telegraphing, account of.	68-9, 74
President of United States, Board's notice of his assassination.	62
Prevalent diseases.	2
investigation of.	77, 78-141
Prevention of small-pox, circular upon.	123
Printing and stationery, accounts of.	68, 74
Privies.	143, 144, 156
Procedures for abatement of nuisances.	55
Procedures under the eighth section of the Organic Act.	2, 20
modes and examples of sanitary procedure.	401-409
Public institutions, Committee on.	18
Purchase of samples for analysis.	74
Quarantine.	4, 18, 226, 234-274, 410-415
Queens county, nuisances and laws in.	22
Refineries of petroleum.	51
Refuges and hospitals for contagious diseases.	411
description, with specifications of material and costs.	415
Registration of births, deaths and marriages.	2, 18, 36, 40-42
Report, upon school hygiene, by Dr. D. F. Lincoln.	189-233
diseases, contagious, of eyes, in schools, by Dr. Agnew.	225-233
Reports of committees.	2, 18
executive and finance.	63-75
registration and vital statistics.	76-78
public institutions.	127-129
quarantine.	238-274
drainage, sewerage and topography.	281
sanitary committee.	427
effluvium nuisances.	337
Dr. Waller's on water-analysis.	427-447
A. H. Elliott on safety testing of oils.	449

	PAGE
Richmond county, special investigations in	95-110
Rochester, city of, its public schools	133, 139-149
Rules, sanitary	114, 121, 260, 264
Rome, city of, schools in	157
Safety-test, to prevent dangers from illuminating oils	18
Salaries and wages, account of	69, 70, 73
Sandy Hill, successful results of vaccination in	67
Sanitary committee, work of	18, 427
Sanitary, drainage	2, 26, 28, 29
inquiry	2, 32
Sanitary laws, new	2, 13, 14, 17, 122, 264, 406, 417-425
Sanitary legislation	18
committee on	18
Sanitary papers relating to the prevention of contagious diseases	112-126
Sanitary precautions for preventing the spread of infectious diseases	116
Sanitary procedures, modes and examples of	401-406
Sanitary provisions against small-pox	2
Scarlet fever	2, 8, 114, 115, 116
Schaghticoke school-house	178
Schenectady, need of sewerage and relief from nuisances	60
public schools of	163
School districts	12
Schools, health in	2, 404
hours	131
the sexes in	131
prevailing sickness in	131
School-houses, inspection of	18, 43-45, 139
hygiene of	129-138, 189-233
Seneca lake, its waters and shores	54, 304
Sewage, disposal of	29, 321, 324, 326
Sewer gas	327
Sewers and sewerage, James T. Gardiner's report on	321-334
Ships at quarantine, and as carriers of contagious diseases	240
Slaughter-house, example of nuisance from and mode of cleansing, etc.	402
Sludge-acid, complaints against	59, 63, 337-390
Small-pox	2, 8, 5, 23, 65, 66, 67, 79-90, 116, 123, 265, 407
Smith, Dr. Wm. M., Health Officer of port, report on quarantine establish- ment	234-276
State Board of Health	1, 18, 422-425
Staten Island	9
what nuisances offend	52, 96-107
Statistics, vital	2, 34-42, 76-78
Stenches, names and designations given	343
identification and description	343-345
their ascertained causes	368
Stench nuisances	2, 19, 59, 337-390
Summer resort, inspection and sanitary reform of one	301
Sun lighting	129
Superphosphates as a nuisance	52-348. See Fertilizers.
Supervisors, county boards of, aiding registration of vital statistics	34

	PAGE.
Swamps and marshes	392. <i>See Malaria and Miasmatic.</i>
Syracuse, its High School	213
Tenements, protection to health in	2, 45, 46
Testers and testing, safety-standard, for illuminating oils	449-494
Tonawanda swamps	19, 28, 306
Tub-system, of earth-closets for schools	155
of earth-closets for refuges and hospitals	411-412
Traveling and other necessary expenses of members	71, 73
of chemists	73
Troy, city of, school hygiene in	168
Typhus and typhoid fevers	4, 8-9, 111, 116, 117, 118, 275
Tysens' canning factory near New Dorp, typhoid fever at	101, 107-110
Utica, request for action in, by Health Officer	59, 153-155
Vaccination	5, 118-126, 135, 254, 264
Ventilation of school-houses	129, 140, 192-204
Villages, public health service in	11, 417
Virus, vaccinal	5-6
Vital statistics	9, 23, 34-42, 76-78
Waller, Elwyn, chemist, reports by, on water-analysis	53, 427-447
Warren and Essex counties, diphtheria in	91
Waterford, schools in	168
Water supplies	2, 10, 24, 145
carriage or sewerage	324
analysis, report on	427-447
description of samples analyzed	428-431
Wells and streams, pollution of	24
Westchester town, diphtheria in	92-93
West Sparta, drainage of abandoned canal in	58
West Troy, public schools in	176
water supply analyzed	428 431
Yellow fever, its record at the New York quarantine	239-247
Yonkers, city of	53, 205
York, drainage of abandoned canal in, and petition of Board of Health	58, 294

 For Index of Chemical Part see next pages.

INDEX OF REPORTS UNDER CHAPTER 407 OF THE LAWS OF 1881,

For Preventing Adulteration of Food and Drugs.

	Page.
Adulteration, definition of, in the law	497
of butter.....	512, 515
the question of, considered	515, 529
Admixtures, permissible under the law.....	508-509
Alum, in baking powders	505, 562, 567-573
"The Alum Question"	567-573
Announcement of the law, by the Board's preliminary circular.....	499
Analysts, chemical, eight employed	501-502
Bakers, their chemicals.....	559-562
Baking powders.....	506, 561
Beers and malt liquors.....	667-678
Bibliography and literature of food and drugs and their adulteration. . .	697-706
of butter, cheese, lard, etc.....	509, 544-547, 558, 584-589
of wines, liquors and spirits.....	628-630, 664-667
of beer and malt liquors	671-678
Brandy, report upon twenty-five samples analyzed	507, 631
Table of analysis of twenty-five samples of, by Dr. Engelhardt	641
fusil oil in	632
adulteration of, and the artificial kinds.....	634
otard and wine, other kinds, artificial composition of	639
Brewers' grains, as food for cows.....	503
Butter, report upon (group ii).....	508, 504-509
records of examinations for water in	515, 527-529
microscopic examinations of.....	529
Caldwell, Prof. G. C., report by, (on group ii)	500-547
Catalogue of standard published works on food and drug adulterations ..	697-706
Cereals, their products and accessories in bread-foods (group iv) Dr. Love's re-	
port on.....	559
bibliography of	584-589
Chandler, Prof. Chas. F., Chairman of Sanitary Committee, general report	
by, on food and drugs.....	501
Cheese, report on.....	504, 529-533
"skim" or "anti-luff"	531, 533
poisonous samples examined and tested	532, 533
Chester, Prof. A. H., report by, (on group iii)	548-558
Citrate, of magnesium, composition of, spurious, etc.	506, 667

	Page.
Colby, Albert[L., report by, on sugar and glucose.....	601-615
Color and chemicals used in coloring liquors and intoxicating beverages, 625, 634	639, 655
" Creameries "	503
Drugs, definition of, in the law	497
report upon crude vegetable and animal (group ix),	
by Dr. Frederick Hoffmann, 681, 689	
powdered, described	686
Engelhardt, Dr. F. E., report by, (on group viii).....	619
Exemptions under the law, how determined	498
Extracts of meat, Liebig's, and six others, analysis of.....	553-555
Farina, oatmeal, rye and barley, etc.....	563-565
Food, definition of, in the law	497
animal	509, 548
vegetable.....	501, 559
Fruits and vegetables, etc., canned (group v), report on, by Prof. S. A. Lattimore, 590	
Gelatine.....	504
Glucose sugars, report upon (group iv), by Dr. W. H. Pitt.....	596-601
Hoffmann, Dr. Frederick, report by, (on groups ix and x).....	679-688
Inspectors of foods and drugs, three employed	501-502
Isinglass, examinations of.....	504, 538
Lard, as an adulterant of butter.....	504, 512
report upon examinations of samples	533-534
Lattimore, Prof. S. A., report by, (on groups v and vii).....	590-595
Lead, chromate of, in confectionery.....	506-601
Liquors, fermented, compound, etc.....	630
chemical analysis of the compound kinds	657-664
colors and chemicals used in coloring.....	655
Love, Dr. E. G., report by, (on group iv).....	559-589
Magnesia, salts of, pharmaceutical.....	508
Meats, canned	504, 548, 556
extracts of.....	553-555
preserves of.....	556
Medicine and medicinal.....	679-695
medicinal preparations, effervescing, report on (group xii), by Prof. W. G.	
Tucker.....	692-695
Milk, statement concerning the report upon (group i).....	503-696
Munsell, C. E., inspector of dairy products.....	502
Oil, olive, its imitations and frauds.....	535-543
spectroscopic tests in examining oils.....	538
of cotton-seed.....	531
tabulated results of the examination of oils.....	541-542
Oleo-margarine.....	503, 510, 511, 515
as an adulterant of butter	512, 513
Penalties for offenses against the Adulteration Law.....	498
Pharmacy and pharmaceutical	507
pharmaceutical chemicals and their preparation, report upon (group x), by	
Dr. Frederick Hoffmann	679-688
Pills, quinine, compressed, sugar-coated, etc. (group xi), report on,	
by Prof. G. C. Caldwell, 689-691	
Pitt, Dr. W. H., report by, (on group vi).....	596-601

	Page.
Pork and hams, American	548
Preserves, of meat.....	556
Quinine, report of examination of.....	504, 689-691
Rochelle salts in seidlitz mixtures	508, 692-694
Rum, report upon, with tabulated analysis of twenty-five samples, by Dr. Engelhardt, 650-654	
Salts, effervescing, granular, etc	508, 692-695
Sarsaparilla, saffron, myrrh, etc	681-682
Seidlitz mixtures	694
Smith, Dr. T. Delap, inspector of foods and drugs.....	502
Soda, baking	505; 560
Spices, and antiseptics employed in preserving, etc., as affecting food-articles, 594	
Starch, description of starches, diagrams and methods of identification . . .	573-583
Sugar, syrups, molasses, glucose, confectionery and honey, reports upon. 596-601	
special report upon sugar, glucose	601-618
grape sugars — glucose analyzed and described by Mr. Colby	604, 612
polariscope in the examination of sugars (diagrams)	608
tests for glucose	611
Tartar, cream of, how adulterated	505, 560-562
Tea, coffee, etc. (group vii), report on, by Prof. S. A. Lattimore	591-595
Terra alba, in confectionery.....	506
Tests of adulteration of butter	515, 539
of adulteration of cheese.	528-532
Trichinæ, described and discussed.....	549, 552
illustrations, instruments and results of examinations	551
Tucker, Prof. Willis G., report by, (on group xii).....	692-695
Whiskey, composition and manufacture of.....	642-645
adulteration and imitation of.....	645-647
analysis of twenty-five samples, by Dr. Engelhardt, tabulated.....	648
Wines, beers, spirits, cordials, report on (group viii), by Dr. F. E. Engelhardt.	
chemical analyses of wines.....	619-678
sulphured wines	624
manufacture of artificial	627
methods of analysis of	632-634

INDEX.

	No.
Academy of Science, resolution of.....	12
Adirondack Survey, report of Superintendent of.....	57
Agricultural Society, State, annual report of.....	43
American Forestry Congress, resolutions of.....	110
Assembly, rules of.....	6, 42, 55'
committees, list of.....	19
boarding-houses, list of.....	35
and Senate, joint rules of.....	7
Attorney-General, answer of, to resolution of February 8, 1882, relative to use of one-horse cars in Brooklyn.....	23
communication from.....	28
Auditor, financial report of.....	3
report of, on expenditure on canals.....	33
tolls, trade and tonnage of the canals, report of, on.....	38
tolls on the canals, report of, transmitting rate of.....	37
Bank Department, annual report of superintendent of.....	5
annual report of, on Savings Banks.....	24
Binghamton Asylum for Insane, annual report of.....	15
Bowling Green Savings Bank, report of receiver of, in response to resolution.....	31
Brooklyn Institute, annual report of.....	51
Brooklyn, one-horse cars in, report of Attorney-General on, in re- sponse to a resolution.....	23
Brooklyn water-front, report of Attorney-General on.....	125
Buffalo, Charity Organization of, annual report of.....	13
Canals, Auditor's report, relative to, in response to a resolution..	86
State Engineer and Surveyor's report, in response to a resolution.....	85
[Assembly Documents.]	

	no.
Canal tolls, resolution relating to.....	56
abolition of, report of State Engineer on, in answer to a resolution.....	63
Central New York agricultural experiment station, report of...	25
Clinton manuscripts, report of State Library on the.....	22
Comptroller, annual report of.....	3
Committee on commerce and navigation, report of, on docks, etc., in the city of New York (see New York).....	8
Convict labor, resolutions relative to.....	45
Criminal statistics, annual report of Secretary of State on.....	40
De Vaux College, annual report of.....	27
Eclectic Medical Society, State, annual report of.....	10
Elections, primary, report of select committee on.....	96
Elmira Reformatory, treatment of inmates of, report of committee on.....	116
testimony taken before committee on management of.....	130
Emigration, Commissioners of, communication from secretary of board of.....	127
annual report of.....	26
Fisheries, Commissioner of, report of	89
General orders, list of, 39, 46, 48, 49, 54, 62, 64, 73, 79, 80, 83, 84, 87, 88, 90, 93, 97, 103, 105, 112, 113, 114, 118	
Governor, annual message of.....	2
Griffith Creek feeder, report of State Engineer and Surveyor on..	17
Health, State Board of, annual report of.....	9
Insurance companies, insolvent, receivers of, report of insurance committee on.....	121
Insurance companies, life, failure of, report of Superintendent of the Insurance Department on, in response to resolution.....	52
Insolvent corporations, receivers of, report of Attorney-General on, in answer to resolution.....	75
Insurance Department, annual report of.....	70

